Thesis/
Reports
Patla
S.M.

NORTHERN GOSHAWK MONITORING PROJECT
REPORT #2

1990

TARGHEE NATIONAL FOREST
St. Anthony, Idaho

Susan Patla
Independent Contractor
P.O. Box 505
Driggs, Idaho 83422

Purchase Order No. 43-02S2-0-0184

Final Report

JULY 1991

LIBRARY COPY
ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION

ACKNOWLEDGMENTS

This project would not have been possible without the initial guidance and direction of Mary Maj, former assistant district ranger on the Teton Basin Ranger District. I greatly appreciated the efforts of Targhee National Forest biologists and other personnel in 1990 who provided maps, photos, many good ideas, and help in the field.

I also want to thank Cole Crocker-Bedford (USFS, Region 10) and Mary Maj (USFS, Region 1) for reviewing the intial drafts and providing many suggestions and ideas. And a final thanks to Debra Patla and Mike Merigliano who helped ferret out poor grammar and weak thoughts. All remaining lapses of grammar or logic are entirely my own responsibility.

Merlin Hare of Victor, Idaho, provided assistance for designing the final report lay-out and graphics.

TABLE OF CONTENTS

INTRODUCTION 1

I. GOSHAWK MONITORING PROJECT 1990:

A. Methods 3

B. Results 4

1. Accipiter Observations 4

2. Active Goshawk Nests 1990 4

a. New Goshawk Nest Sites Found in 1990 4

b. Occupancy of Former Goshawk Nest Sites, 1990 6

3. Great Gray Owls Nesting in Goshawk Nests, 1990 7

4. Timber Areas Surveyed, 1990 7

C. Discussion: Goshawk Monitoring 1990 8

1. Monitoring Project Summary 8

2. Use of Taped Vocalizations 9

II. GOSHAWK NEST TREE AND STAND HABITAT DATA, 1980-1990

A. Methods 10

B. Results 10

1. Nest Tree Data 10

2. Nest Stand Data 13

C. Discussion 16

LIST OF TABLES

TABLE 1. NUMBER OF GOSHAWK NESTS & HABITAT DATA COLLECTED PER KNOWN NEST CLUSTER, 1980-90 TARGHEE NATIONAL FOREST. 11

TABLE 2. SUMMARY GOSHAWK NEST TREE DATA BY SPECIES, 1980-1990 TARGHEE NATIONAL FOREST. 12

TABLE 3a. SUMMARY GOSHAWK NEST STAND DATA, DOUGLAS FIR STANDS 1980-1990 TARGHEE NATIONAL FOREST 14

TABLE 3b. SUMMARY GOSHAWK NEST STAND DATA, LODGEPOLE PINE & ASPEN STANDS, 1980-1990 TARGHEE NF. 15

TABLE 4. GOSHAWK NEST CLUSTER YEARLY MONITORING SUMMARY 1980-1990 TARGHEE NATIONAL FOREST. 19

TABLE 5a. GOSHAWK NESTING LOCALES I: STATUS AND MANAGEMENT ACTIVITY, 1980-1990 TARGHEE NATIONAL FOREST. 21

TABLE 5b. GOSHAWK NESTING LOCALES II: STATUS AND MANAGEMENT ACTIVITY, 1980-1990 TARGHEE NATIONAL FOREST. 22

TABLE 6. OCCUPANCY RATES, UNDISTURBED AND POST-HARVEST NEST LOCALES, 1988-1990 TARGHEE NF. 24

TABLE 7. REOCCUPANCY RATES 1980-1990. GOSHAWK NEST SITES IN NON-HARVEST AND 1970-79 HARVEST LOCALES TARGHEE NATIONAL FOREST. 26

TABLE 8. REOCCUPANCY RATES 1980-1990. GOSHAWK NEST SITES IN 1980-90 TIMBER SALES LOCALES TARGHEE NATIONAL FOREST. 27

TABLE 9. TIMBER HARVEST ACRES 1980-1996, OLD GROWTH MANAGEMENT ACRES, AND GOSHAWK NEST CLUSTER STATUS, 1980-1990 TARGHEE NATIONAL FOREST. 34

III. MONITORING THE NORTHERN GOSHAWK, SUMMARY OF DATA COLLECTED, 1980-1990 TARGHEE NATIONAL FOREST

A. Methods

1. Determination of Nesting Territories. 17

2. Analyzing Monitoring Data. 18

B. Results. 18

1. First Analysis: Status of Known Nesting Locales. 20

2. Second Analysis: Occupancy and Productivity Rates, 1988-1990. 23

3. Third Analysis: Reoccupancy Rates 1980-1990. 25

C. Discussion: Monitoring Data 1980-1990

1. Status and Occupancy of Known Goshawk Nesting Locales. 29

2. Use of the Goshawk as a Management Indicator Species. 31

a. Estimating Goshawk Breeding Pairs. 32

b. Timber Management and the Goshawk. 32

IV. RECENT MANAGEMENT GUIDELINES FOR MANAGING THE GOSHAWK

A. USFS Region 1. 36

B. Kaibab National Forest. 36

C. Interim Management Guidelines, Goshawk Scientific Committee, USFS, Region 3. 37

D. Tongass National Forest. 38

V. CONCLUSIONS. 38

VI. REFERENCES. 40

VII. APPENDIX TABLES

GOSHAWK MONITORING REPORT 1990

Targhee National Forest

INTRODUCTION

The Targhee National Forest selected the northern goshawk (*Accipiter gentillis atricapillus*) as a management indicator species for mature and old growth forest habitat in the early 1980's (***Land and Resource Management Plan***, Targhee NF, 1985, p. 557). The Forest also established management guidelines to prevent disturbance to nesting accipiters and to maintain their nesting habitat by creating 10 acre buffer zones around known nests in timber harvest areas and maintaining a forested environment adjacent to at least portions of the buffer areas (***Timber-Wildlife Coordination Guidelines***, FSM 2600, TNF Supp 2 9/79).

Between 1980 and 1987, district biologists documented the location of 16 goshawk nests on the forest. Most of these nests were found in timber sale units (usually after the units had been sold and often as harvest was underway) in the Caldera area of Island Park, and in the Centennial, Teton, and Big Hole Mountain Ranges (Management Areas (MA) 10, 4, 15, and 16).

Specific monitoring for goshawks by biologists prior to timber sales occurred mainly in Douglas fir (*Pseudotsuga menziesii*) stands during the process of individual tree selection. No goshawk surveys or inventories were undertaken in non-sale areas of the Forest. Though some nests were rechecked in years following discovery, this did not occur at most sites on an annual basis.

In 1988 a volunteer project began under the direction of Mary Maj (USFS, Teton Basin RD) to develop a monitoring program for the goshawk. Information was collected from district biologists, and checking and evaluating known nest sites and historic sight records began. In 1989 and 1990 the Forest funded a goshawk monitoring project. In 1989, the main thrust of the project was to locate historic nest sites, search for alternate nests, collect habitat data and summarize past nesting activity. Some proposed timber sale areas were surveyed also. A copy of the 1989 report is available at the Targhee Forest Supervisor's office (P.O. Box 208, St. Anthony, Id. 83422).

The present report contains three major sections. The first part summarizes the 1990 monitoring program. Surveying proposed timber sale areas comprised a major part of the project in 1990. Known nest sites were also rechecked and habitat data collected at new sites.

In the second section, all habitat data collected during the past decade has been summarized including data from the 1990 season. The third section summarizes what we know to date about the goshawk population on the Targhee National Forest. Included here is occupancy data for nest sites checked during the last three years of the monitoring project, and also reoccupancy data for all nests identified over the past decade.

Recently published information on goshawk biology, productivity and forest management has been incorporated throughout the report. Appendices located at the end contain detailed tables with specific nest site and monitoring data on the local goshawk population for use by Targhee Forest personnel.

NOTE ON TERMINOLOGY: Terms relating to goshawk biology as used in this paper are defined below. Definitions used in the 1989 report have been revised somewhat based on a review of goshawk publications including the recently released "Northern Goshawk Scientific Committee Terminology" (Region 3, USFS), and discussions with other biologists. I have incorporated and combined material from a number of sources in order to develop clear and workable terminology for the data presented here.

nest site--the nest, nest tree, and small area immediately surrounding the nest including structure of the vegetation and the topography. If fledged young were found in an area during the breeding season (mid-July to mid-August), it is designated a "nest site" even if the actual nest tree was not located.

alternate nest--goshawk home ranges usually contain two or more nests, only one of which will be active in a given year. Goshawks may alternate between one or more of these nests on an annual or semi-annual basis. Alternate nests can be within the same stand in adjacent trees or in different stands. Distance between stands containing alternate nests believed to be within the same breeding territory have been measured up to .7 miles on the Targhee NF.

nest stand--the intact stand of trees containing and surrounding the nest. In a harvested area, it refers to the untreated/unfragmented forested area that remains around the nest tree. A nest stand may contain more than one nest site.

nest cluster--a group of nest sites and alternate nests presumed to belong to one territory.

nesting locale--the area where the nest cluster is located for a particular territory.

territory--the area where no more than one pair of birds nest. A territory would include the nest clusters or all nest sites and alternate nests for a pair.

home range--the entire area that a goshawk uses for nesting, foraging, resting, watering, etc. Home range size in goshawks can exceed 7000 acres (see page 16). Adjacent pairs of goshawks have overlapping home ranges--they are not exclusive areas.

I. GOSHAWK MONITORING PROJECT 1990

A. METHODS

The 1990 goshawk monitoring contract specified that the contractor would recheck known goshawk nests on three districts, field check specified proposed timber sale areas for goshawk activity and nest sites, and collect nest tree and stand data at occupied nest sites. As in 1989, I also presented slide show lectures at district summer orientation programs in June on goshawk biology and raptor identification.

I began rechecking a few known nest sites in April and May, but the majority of sites were checked later in June and July. Although goshawk courtship behavior should be observable by mid to late March, access to most Forest sites remains difficult early in the season. Incubating birds can be observed by mid- April though visual and auditory clues are often minimal in the early nesting stage. I took precautions during the incubation period to avoid unnecessary disturbance which could result in nest desertion. I would approach a nest to the point where it could be observed clearly and then leave immediately once occupancy was determined.

At historic goshawk nest sites, I would check the last known active nest first. If the nest was unoccupied, checks were made at other alternate nests in the area if known. Time was not available this year to search for other possible alternate nests at most unoccupied sites. I played taped adult alarm calls in the vicinity of unoccupied nests starting in the post-hatching period in mid-June to attract any nearby nesting goshawks. If a nest was found occupied, I would attempt to return at intervals throughout the summer season to gather data on nest success, fledge dates, and prey use. Pellets and feathers were collected for later analysis. I also photographed nest trees and surrounding habitat.

Surveying proposed timber sale areas began in late June. In these areas, I used broadcast vocalizations or vocal imitations of adult alarm calls to draw in goshawks until mid-July. From mid-July until mid-August, I used both adult alarm calls and juvenal food-begging calls. At least 3 visits were made to each area, and high quality habitat sites (dense stands of mature and old growth timber with open understories) within these areas were surveyed at least twice. Given the total acreage involved this year (over 3000), it was not possible to survey every acre of these sale areas.

Transects through potential goshawk habitat were planned using topographic maps and aerial photos. While walking a transect, I would play a tape of goshawk calls or make vocal imitations every 5-10 minutes depending on terrain and habitat. After playing a call, I would wait 2-3 minutes looking in all directions, listening intently for a response. I used an adult alarm call until mid-July (fledge time), then both an alarm call and juvenile begging call for the rest of the season. All transects were hiked.

Constant visual searching for nests, whitewash, and prey remains in high quality habitat areas determined the monitoring pace. Transects of an estimated 4-8 miles per day in high to moderate

quality habitat could be searched, with much larger distances covered in marginal habitat areas. All potential prey species sighted within a search area were recorded. (For methods of collecting and analyzing habitat data see Section II.)

B. RESULTS: GOSHAWK MONITORING PROJECT 1990

Overall in 1990, three major proposed timber sales in the Centennial Mountains (MA 4) were surveyed (Miner's Creek, Icehouse, Hotel Creek): a total of 30 historic nests were checked with help from district biologists: 12 active goshawk nests were identified (including 6 new sites for the Forest); and nest stand data was collected at 7 sites.

Appendix I (Tables IA-E) contains a summary of 1990 site visits by district including dates, times, locations and survey results. Total project monitoring time for 1990 equalled 297 hours: 200 field hours and 97 travel hours (3912 miles). Monitoring hours per district were as follows:

DISTRICT	HOURS	PERCENT TOTAL
D-1	72	36%
D-2	69	34
D-3	16	8
D-4	18	9
D-5	25	13

1. Accipiter Observations 1990

Appendix Table II presents all known observations made of the goshawk, Cooper's Hawk and sharp-shinned hawk in 1990 on the Targhee NF. Included in this list of 40 sightings are return visits made by the monitor to active goshawk nest sites and the type of activity observed at each visit. Forty percent of reported sightings were made by US Forest Service personnel, demonstrating the value of having an ongoing training program for field workers.

2. Active Goshawk Nest 1990

In 1990, a total of 12 active goshawk nests were located which produced an average of 2.2 young. Appendix Table III lists all 1990 active nests along with locations, nest tree species, and productivity.

a. New Goshawk Nest Sites Found in 1990

Six of the 12 active nest sites located in 1990 are newly identified territories for the Targhee NF. Three of these new territories are located in proposed timber sale areas. These six new nest

sites were first reported between June 22 and August 10. At 5 of the 6 nest sites, vocalizations of adult or young goshawks attracted observers to the nests. At the remaining site, an adult goshawk flew and perched within 75 feet of the monitor after an alarm call tape was played on July 11. The nest was subsequently found about 400 hundred feet away.

New information on goshawk breeding territories on the Targhee NF resulted from observations at three of the new nest sites. Perhaps the most significant of the new territories located is in a proposed timber sale area at Polebridge (MA 9). The nest was found in a 130 acre stand of dense lodgepole pine (*Pinus contorta*) surrounded by clearcuts harvested in 1987. Intensive timber management activities have occurred in MA 9 since the mid-seventies to salvage lodgepole pine infested with the mountain pine beetle (***Land and Resourse Management Plan***, Targhee NF, p. 326).

The stand in which the goshawk nest was located is one of 7 contiguous unfragmented stands greater than 125 acres left within the proposed sale area. Most of the smaller existing stands were surveyed in 1990 for goshawk and other wildlife activity but no goshawks were reported seen or heard in these stands (*pers. comm.*, Gail Worden, biologist, USFS Ashton RD).

The lodgepole pine nest tree at Polebridge appears in some ways to be a marginal nesting location. By the end of July, the nest had already began to fall apart due to the small size of supporting limbs in the nest tree. A fully feathered decaying young goshawk was discovered laying under the nest but cause of death could not be determined. Another young did fledge successfully.

The nest tree DBH is 10.3" (26cm). The average stand DBH of lodgepole pine (trees 7" DBH and greater) is 8.8" (22cm). The largest DBH within the plot measured 11.6" (29cm). (In comparison, the average size Douglas fir nest tree where the majority of nests have been found on the Forest is 20.5" (52cm) and the average stand DBH for Douglas fir is 13.7" (35cm). See Tables 2 and 3). The Polebridge stand has an estimated canopy cover of 40%, the lowest for any nest stand found on the Forest (Appendix Table IV).

Crocker-Bedford and Chaney have suggested that goshawks nesting in stands with few large trees for perches and less dense canopies than average are probably individuals forced to used marginal habitats (1988, p. 215). It is likely that nesting goshawks may be limited in the MA 9 area by the lack of suitable large nesting stands and trees due to extensive insect kill and harvesting in the lodgepole pine forests which has occurred in this area since the 1960's.

Available foraging habitat may also be limiting in MA 9 due to decreases in forest prey species such as tree squirrels and woodpeckers, following clearcut harvesting. Decreases of tree squirrel and bird populations have been documented even when stands are only partially harvested (Crocker-Bedford, 1988, p. 213; Reynolds, 1989, p. 99). Of the identified common prey items used by goshawks on the Targhee), ground squirrels may be the only species whose population possibly increases after clear-cutting activities (Patla, 1989). Clearcut situations, where prey items do not increase and where small trees and brush become quickly established (hindering goshawk foraging attempts), may impair goshawk foraging while benefitting competitive raptors (Crocker- Bedford, 1990, p. 267).

At two other new nesting sites for the Forest, of interest is the close proximity of active goshawk nests to other species of nesting raptors. At Gooseneck in the Big Hole Mountains, an active goshawk nest was located approximately 300' (91m) away from an active Cooper's Hawk (*Accipiter cooperii*) nest. I observed an immature Cooper's Hawk on July 23 dive at a juvenile goshawk perched within 75'(23m) of the Cooper's nest tree and drive the goshawk back toward the area of its own nest tree. The Cooper's appeared to strike the back of the goshawk as it flew away. A few weeks later, the district biologist found a group of fledged sharp- shinned hawks within 1/4 mile of the goshawk nest as well. District personnel have adjusted unit boundary lines within this proposed sale area and proposed dropping unsold units to preserve an intact forested area of approximately 380 acres surrounding the goshawk nest.

Another goshawk nest first identified in 1990 near Henry's Lake in a mixed Doug fir and aspen stand was found only 300' (91m) distance from a bald eagle (*Haliaeetus leaucocephalus*) nest which had been active the year before but was not occupied in 1990. Also, an active red-tail hawk (*Buteo jamaicensis*) nest was located in 1990 approximately .25 mile on the edge of this forest stand. Both eagle and red-tail nests are in the upper canopies of large Douglas fir trees. The goshawk nest is located just below the canopy layer in an aspen. Due to the multi- layered canopy in this forest stand, the eagle nest was not visible in July from the vicinity of the goshawk nest.

b. Occupancy of Former Goshawk Nest Sites in 1990

Sixteen goshawk nest clusters (a total of 30 individual nests) which had active sites in previous years were rechecked in 1990 (Appendix Table IV). Six of the clusters (38%) were reoccupied in 1990. At four of the reoccupied clusters where the active nest had been identified in previous years, goshawk pairs used alternate nests in 1990. The movement of goshawks between alternate nests has been well documented. In a three year study in Arizona, no goshawk nest was ever found to be used in consecutive years (Crocker-Bedford and Chaney, 1988). Woodbridge showed in northern California that 88% of his control pairs moved nests following first year of discovery (1988).

The alternate nest used at Rocky Canyon (MA 17) had been found in October 1989 approximately .4 mile (.6 km.) south of the original nest in another side drainage leading into the south fork of the Snake River Canyon. Both nests are in mature aspen (*Populus tremuloides*) stands.

At Kay Creek (MA 4), the alternate nest was in a Douglas fir tree (*Pseudotsuga menziesii*) only 300' and within sight of both the Douglas fir nest tree used in 1989 and another alternate nest tree. This unit was later harvested in fall 1990; the nest trees and a few trees surrounding them were marked for saving.

No activity had been recorded at Three Mile Creek (MA 4) since 1983 although the nest tree and the immediate vicinity around it had been checked in four subsequent years. In 1990, an active alternate nest was located .25 mile (4 km) downslope. Both stands containing nests are

scheduled for harvest in 1991.

At Sheep Creek (MA 4), active in 1985 and 1987, no occupied nests had been documented in the previous three years (1988-90) even though a total of 3 alternate nests had been found in 1989 within .25 mile of the original tree in an unfragmented stand of 47 acres. The active nest found in 1990 is in a 93 acre contiguous stand located .7 mile (1.1 km) north on Chicken Creek. Most of the stands in this area underwent overstory removal in the 1970's. As is obvious from aerial photos, the goshawk nests are located in the only remaining large dense stands with intact canopy cover in the area.

3. Great Gray Owls Nesting in Goshawk Nests, 1990

Great gray owls (*Strix nebulosa*) nested in four known goshawk nests in 1990 on the Targhee NF: Steel Creek, Alex Draw, Walking Fish, and Taylor-Carrot. These nests are all in Douglas fir trees in the Centennial Mountains (MA 4). Three of the four sites are in or near areas of timber harvest activity. The third, Walking Fish, is in an open park-like stand of old growth Douglas fir. The first documented nest site of great gray owls in the Centennial Mountains in Idaho was at the Taylor- Carrot nest in 1988 although individual owls had been sighted previously in the range.

There appears to be a close association between goshawks and great gray owls throughout their respective ranges. In a logged study site in Oregon, half of the great gray owl nests found were in vacated goshawk nests (Bull et al, 1988). Mikkola reports that in Finland, 56.6% of great gray owl nests located were former goshawk nests (1983, p.199). He also states that the two species are highly competitive and that the great gray owl can and often will take possession of a nest which a goshawk has already began to repair for the season (p. 188). The two species can nest in close proximity to one another. In 1989, I located an active goshawk nest within .25 mile of a great gray owl nesting in an alternate goshawk nest. Both nests were in lodgepole pine in an undisturbed lodgepole pine stand on the Bridger-Teton National Forest. From observations made at Steel Creek in April 1991, it appears that both species arrive and began to select nest locations at approximately the same time in early April in the Centennial Mts.

It may well be that the great gray owl depends upon the goshawk to provide nests in some parts of its range. A decline in goshawk breeding pairs in some areas of the Forest might result in a decline in productivity in local great gray owl populations as well if available stick nests are not repaired or replaced periodically by the hawks. The relationship between these two species on the Targhee NF both in untreated and harvest areas deserves further study.

4. Timber Areas Surveyed 1990

Daily field reports were filed with district biologists on monitoring surveys done in 1990 in proposed timber sale areas in the Centennial Mountains (MA 4). Reports contained detailed descriptions of the routes surveyed, wildlife species sighted, and any accipiter nests located.

To summarize briefly, I located an active goshawk and a Cooper's nest in the Icehouse timber sale area in approximately 1000 acres of intact forested habitat. No nests were found in areas which had been selectively harvested in the late 1970's. The remaining Douglas fir sawtimber in these treated acres (approximately 580 acres) averages 14" DBH with stand densities ranging from 35 to 76 trees/acre. The active goshawk nest is located 3/4 mile from the nearest treated unit (data provided by John Councilman, Island Park Ranger Distirict).

Most of the Hotel Creek proposed sale area had been selectively cut or undergone shelterwood harvest in the 1970's except for some of the steeper drainages. I did not locate any accipiter nests within this area.

In the Miner's Creek sale area, a large intact, unroaded forested habitat exists, much of which appears to be excellent goshawk habitat with large older trees and dense canopy cover. I located two unoccupied nests in one old growth Douglas fir stand. A Forest Service employee found two possible goshawk stick nests later in the fall in an isolated stand of Douglas fir in another part of the sale area. One of these nests appeared to have been active in 1990 as pellets and feathers were seen under the nest.

C. DISCUSSION: GOSHAWK MONITORING 1990

1. Monitoring Project Summary

More active goshawk nest sites were identified on the Targhee NF in 1990 than in any previous year. Monitoring of historic nest sites, surveying proposed sales areas, and training personnel in goshawk recognition has resulted in increased numbers of known active nests and the discovery of many new nest locations compared to years prior to the monitoring program.

Surveying suitable habitat in order to locate nest sites prior to unit lay-out in proposed timber sale areas makes it possible to plan for conservation management of nesting stands and territories. Monitoring of historic nest sites provides useful information pertaining to the relationship of forest management and the goshawk. Data from 1990 also suggests that managing the goshawk may have important implications for the local great gray owl population, a sensitive species on the Forest.

In the past two years, it should be noted, monitoring in designated proposed timber sales areas containing uncut forested tracts in the Centennial Mts. (MA 4) has resulted in finding goshawk nest sites in all such areas (Walking Fish, Icehouse, Miner's Creek, Three Mile Creek). Equally important is finding nest sites in proposed sales areas such as MA 9 (Polebridge) where past harvesting has reduced the amount of remaining habitat available for nesting goshawks. By incorporating surveys for goshawks in initial timber sale planning, monitoring can be scheduled during the optimum seasons to insure that nest sites are identified in time to allow for effective management of the species.

2. Use of Taped Vocalizations

The use of taped goshawk calls and familiarity with goshawk vocalizations are important aspects of any goshawk monitoring program. Two papers recently released on studies of goshawk responses to taped calls present useful information in planning monitoring programs (see Kennedy and Stahlecker, 1991; Kimmel and Yahner, 1990). Kennedy and Stahlecker also include detailed protocols for goshawk surveys and long-term monitoring in the southwest.

They found detection rates using taped calls were highest during the nestling period (June) compared to the courtship (April) or fledgling-dependency (August) periods. The nestling period was also the only period in which response rate to taped calls differed significantly from controls (walking a transect without playing calls). The alarm call (directed by both adults at intruders or predators) evoked more responses during the nestling period compared to the wail call (a single note call of communication between pair members). During the fledgling-dependency period, the food beg call (given by young to attract adults) and wail call resulted in the most responses (Kennedy and Stahlecker, 1991). In another study, taped goshawk calls were found to be much more effective than use of great horned owl calls (Kimmel and Yahner, p.110)

Kennedy and Stahlecker suggest the following methods for making a complete census of breeding goshawks in a prescribed area: Transects during the six week nestling period should be located 300 meters (984 ft) apart and taped alarm calls should be played every 150-200 meters along the transects. An observer should stand quietly for a minute, then play 30 seconds of the call, wait 30 sec, then play 10 sec every 30 sec for a 3 minute period, covering the four cardinal directions during the 10 sec calling times. While playing the calls, an observer must constantly scan in all directions in order to detect a silently approaching goshawk. To effectively inventory a large area, a team of 5-6 people could be used to cover approximately 1 sq km/hour. One person could cover 2 sq km per 12 hour period (Kennedy and Stahlecker, 1991).

Kennedy and Stahlecker recommend that surveys with taped calls be done during the nestling period for two reasons: this is the only period when responses to the tape differ significantly to controls, and surveys later in the season may miss unsuccessful nesting attempts so underestimate the number of active territories. Of interest, however, is the fact that both the frequency and percent of responses recorded was greatest during the fledgling-dependency period (see Figures 2 and 3, Kennedy and Stahlecker, 1991). This confirms past data from the Targhee NF: most of the historic nest site records for the Forest have been reported from mid-July to mid-August when the young goshawks food-beg. These calls can be heard from a long distance and greatly aide finding nests in locations off planned transects routes and trails.

Studying the data from the southwest and reviewing monitoring results from the Targhee NF, I would suggest that surveys with taped calls be done during both the nestling (mid- June to mid-July) and the post-fledgling period (mid-July to mid- August) in order to maximize the available survey season. Although Kimmel and Yahner (1991) found no difference in response rate related to time of day, I would suggest from my own experience that planning surveys in morning and afternoon/evening time periods during the fledgling-dependency period when the young seem to be most responsive (especially on very warm days) might increase the chances of finding birds during this time. If surveys are to be done without use of taped vocalizations, they definitely

should be scheduled during this fledgling-dependency period. Although such later surveys will not detect failed nesting attempts, they can supply valuable data on active sites and number of young produced.

A summary of recommendations for future monitoring work and an outline of the 1991 monitoring program on the Targhee NF can be found in the **Section V. Conclusions** of this paper.

II. GOSHAWK NEST TREE AND STAND HABITAT DATA, 1980-1990

A. METHODS

Habitat data at nest sites were collected at two levels: nest tree data and nest stand data. Tree data included tree species, height, age, and DBH; nest height and aspect; and site elevation and slope (clinometer). For stand data, all trees within a 66' radius circle (approx. 1/3 acre plot) around the nest tree were counted and DBH taken. Tree density per acre was then calculated using a factor of 3.18. Also recorded were number of snags greater than 2" DBH, and distances to permanent water sources and alternate nests if known.

B. RESULTS

Over the past decade, a total of 48 goshawk nests have been located on the Targhee NF, representing 34 separate nest clusters or territories. This averages 1.4 nests per territory. As most goshawk territories are thought to contain at least 2-3 alternate nests, future searches could well double or triple the number of nests in identified territories. **Table 1** summarizes the number of nests found per territory, the number still known to exist, nest tree species, and what type of habitat data has been collected at each territory.

1. Nest Tree Data

Forty nests (83%) have been found in Douglas fir trees, four (8%) in lodgepole pine, and four (8%) in aspen. Nest tree measurements have been taken at 35 nests (76% of total). **Table 2** summarizes nest tree data by tree species. (Nest tree data for individual nests can be found in Appendix Table V A-D.)

For comparative purposes, Douglas fir nest tree data in **Table 3a** has been summarized both for all located nests measured, and for known active nests only. The values are almost identical. Although the majority of active and alternate nests have been found in Douglas fir stands in the Centennial Mountains (MA 4), I have also broken out average values for all other management areas where Douglas fir nests are found.

TABLE 1. NUMBER OF GOSHAWK NESTS & HABITAT DATA COLLECTED PER KNOWN NEST CLUSTER, 1980-1990
TARGHEE NATIONAL FOREST

#	TERRITORY	#NEST TREES LOCATED 1980-90 (1)	#KNOWN NEST TREES 1990 (1)	NEST TREE SPECIES(2)	#NEST TREE DATA COLLECTED 1980-90	#NEST STAND DATA COLLECTED 1980-90
1.	Divide Creek	NF	NF		0	0
2.	Fritz Creek	2	2	DF	1	0
3.	South Fork Deep Creek	1	1	DF	1	1
4.	South Three Mile Creek	2	2	DF	2	1
5.	East Rattlesnake	1	1	DF	1	0
6.	Sheep Creek	5	5	DF	5	0
7.	Pete Creek	1	0	DF	1	0
8.	Miner's Creek	2	2	DF	0	0
9.	Alex Draw	1	1	DF	1	1
10.	E. Steel Creek	2	2	DF	1	1
11.	Kay Creek	3	3	DF	3	2
12.	Walking Fish TS	2	2	DF	2	2
13.	Taylor-Carrot TS	2	2	DF	2	0
14.	Dry Canyon (Icehouse TS)	1	1	DF	1	1
15.	Staley Springs	1	1	ASP	1	1
16.	Polebridge TS	1	1	LPP	1	1
17.	N. Antelope Rd.	1	0	LPP	0	0
18.	Eccles Rd.	1	1	LPP	1	0*(3)
19.	Anderson Mill	1	0	DF	0	0
20.	Fall River Ridge	3	3	2 DF, ASP	1	1
21.	Hominy Peak (MA 12 TS)	1	1	DF	1	1
22.	Morris/Horse Creek	1	0	DF	1	1
23.	Teepee Creek	1	0	DF	1	1
24.	Pole Canyon	NF	NF		0	0
25.	Bustle Creek	NF	NF		0	0
26.	Grandview TS	3	1	DF	2	0*
27.	Gooseneck TS	1	1	DF	1	1
28.	Graham Spring (KirkhamHollow TS)	NF	NF		0	0
29.	Kirkham Hollow (CanyonCr TS)	2	2	DF	1	1
30.	Canyon Creek TS Unit 247/20	NF	NF		0	0
31.	Ruby Creek (ArgumentRidge TS)	1	1	LPP	1	1
32.	Rocky Canyon	2	2	ASP	2	2
33.	Water Canyon	1	0	DF	0	0
34.	Long Gulch	2	2	DF	0	0
	TOTALS:	48	39	40 DF 4 ASP 4 LPP	35	20

FOOTNOTES:

(1) NF no nest tree located but fledged young found in area
(2) Tree species: DF Douglas fir, LPP lodgepole pine, ASP aspen
(3) O* data collected post harvest but disgarded due to tree fall in buffer zone

TABLE 2. SUMMARY GOSHAWK NEST TREE DATA BY SPECIES, 1980-1990 TARGHEE NATIONAL FOREST

	TREE AGE (years)			TREE HEIGHT (ft)			TREE DBH (in)			NEST HEIGHT (ft)			ELEVATION (ft)		
	MEAN	STD	(N)	MEAN	STD	(N)	MEAN	STD	(N)	MEAN	STD	(N)	MEAN	STD	(N)
DOUGLAS FIR NESTS (DF)															
ALL DF NESTS	164	43	(15)	84	17	(29)	20.5	5.1	(29)	40	11	(29)	7101	358	(29)
ACTIVE DF NESTS ONLY	158	45	(12)	84	16	(19)	20.8	5.5	(19)	40	11	(19)	6993	362	(19)
MA 3 DF															
MA 4 DF	168	48	(7)	88	14	(11)	20.7	4.5	(11)	41	9	(11)	7131	287	(11)
MA 12 DF	130	5	(2)	80	19	(2)	18.8	3.8	(2)	56	14	(2)	6500	400	(2)
MA 15 DF	NA			60	10	(2)	12.3	1.8	(2)	35	5	(2)	6525	25	(2)
MA 16 DF	163	48	(3)	88	8	(4)	26.5	3	(4)	32	7	(4)	7095	152	(4)
ASPEN NESTS															
ALL ASPEN NESTS	91	1	(2)	65	6	(3)	11.4	0.6	(3)	39	2	(3)	6107	575	(3)
LODGEPOLE PINE NESTS															
ALL LODGEPOLE NESTS	97	14	(3)	66	11	(3)	10.3	1.4	(3)	41	6	(3)	6497	450	(3)

Though sample sizes are small and not statistically significant, the data suggest that Douglas fir nest trees found in mixed conifer stands on the west slope of the Teton Range (MA 15) may be of smaller average diameter (12.3"), and nest trees in the Big Hole Mountains (MA 16) larger (26.5") than those located in the Centennial Mountains (20.7").

The average diameters for lodgepole pine and aspen nest trees are almost half that of Douglas fir. Average nest tree height is also 22% shorter for these species but the nest height is almost identical.

Nests have been found between 5700 and 7800 ft. with the majority located between 6500 and 7000 ft elevation.

2. Nest Stand Data

Nest stand data collected for 20 sites at 17 different territories is summarized in **Table 3a** (Douglas fir) and **Table 3b** (lodgepole pine and aspen). Fourteen out of the 20 sites measured are in Douglas fir stands which contain 0-20% lodgepole pine. Three sites were measured in lodgepole pine stands, two of which are pure pine stands. The third contains 14% Douglas fir and the nest itself was located in a Douglas fir. In the three aspen stands measured, only one contains pure aspen with the others having a mixture of Douglas fir. All goshawk nests were found in aspen trees within these stands. (See Appendix Table VI A-C for individual site stand data.)

Nest stand density data has been recalculated in this year's report based on trees with 7" and greater DBH compared to 5" minimum used last year. This is to allow easier comparisons to stand data collected by Targhee forest personnel. Timber for most Douglas fir and lodgepole pine is classified suitable for sawtimber if 7" or greater DBH (John Councilman, silviculturist, Island Park RD).

Average number of trees per acre or stand densities for all species equal to or greater than 7" DBH ranks highest in aspen nest stands (193 trees/acre) but all measured stands had at the minimum 145 trees per acre. The average stand DBH for trees of 7" and greater DBH is highest in Douglas fir nest stands ranging from 12" (30cm) in the Big Hole Mts. (MA 16) to 14.4" (36cm) in the Centennial Mts. Average stand DBH is lower for the other tree species: 9.1" (23cm) in lodgepole pine stands and 10.0" (25cm) in aspen.

Figures for average estimated canopy cover were similar for all stands ranging from 67% in lodgepole to 72% for aspen and Douglas fir. There was a very wide range and standard deviation for distance to permanent water sources from measured nest sites indicating that location of water sources by themselves are not a particularly useful feature for locating goshawk nests on the Targhee NF.

TABLE 3a. SUMMARY GOSHAWK NEST STAND DATA, DOUGLAS FIR STANDS, 1980-90 Targhee NF

DOUGLAS FIR STANDS

	ALL STANDS			MA 4			MA 15			MA 16		
	MEAN	STD	(N)	MEAN	STD	(N)	MEAN	STD	(N)	MEAN	STD	(N)
DENSITY (trees/acre):												
All Species 7"and above	154	47	(14)	145	50	(8)	151	40	(2)	164	21	(2)
Doug Fir > 7" and above	143	44	(14)	134	40	(8)	134	44	(2)	146	28	(2)
Lodgepole> 7" and above	19	8	(8)									
All Species 3-7"	59	49	(14)									
Snags	47	37	(14)	42	25	(8)	64	25	(2)	81	62	(2)
DBH (IN) DOUG FIR	13.7	2.2	(14)	14.4	2.5	(8)	12.4	1.1	(2)	12	0.9	(2)
CANOPY COVER (%)	72	10	(11)	68	7	(7)				65	5	(2)
DIST. TO ALT NEST (ft)	1265	1406	(7)									
DIST. TO WATER (ft)	950	711	(7)									

TABLE 3b. SUMMARY GOSHAWK NEST STAND DATA, LODGEPOLE PINE & ASPEN STANDS, 1980-1990.
TARGHEE NATIONAL FOREST

	ALL STANDS		
	MEAN	STD	(N)
LODGEPOLE PINE STANDS			
DENSITY (trees/acre):			
All Species > 5"	265	108	(3)
Lodgepole > 5"	255	94	(3)
All Species 3-5"	91	65	(3)
Snags	166	49	(3)
DBH (in) Lodgepole	8.4	1.2	(3)
CANOPY COVER (%)	67	21	(3)

	ALL STANDS		
	MEAN	STD	(N)
ASPEN STANDS			
DENSITY (trees/acre):			
All Species > 5"	228	35	(3)
Aspen > 5"	175	68	(3)
All Species 3-5"	21	23	(3)
Snags	24	14	(3)
DBH (in) ASPEN	9.6	1.3	(3)
CANOPY COVER (%)	72	9	(3)

C. DISCUSSION

Average stand densities, DBH, and canopy cover presented in **Table 3a&b** confirm what studies from other areas have shown: goshawks select for dense, older stands of mature and old growth timber with high canopy cover for nesting sites (Reynolds, 1989). Another important factor regarding nesting stands is the documented long-term reoccupancy rate of individual nest trees and stands by different goshawks over time (Reynolds, 1983; Crocker-Bedford, 1990).

The data collected on nest tree and stand information on the Targhee NF should be useful in identifying high quality goshawk nesting habitat and stands containing potential active nest sites for environmental assessments of timber sale areas, but successful management of goshawk habitat requires a much broader perspective for at least two major reasons:

1.) Home range determinations show that the goshawk uses very large areas for foraging. The most recent data on goshawk home range size, based on radio tracking 10 goshawks in the Shasta-Trinity and Klamath National Forests in northern California, determined a mean home range of approximately 7500 acres (11.7 sq. mi) using 100% minimum convex polygon calculations. At the 95% confidence level, the mean home range was almost 5000 acres or 7.8 sq. mi (*pers. comm.,* Karen Austin, Shasta Trinity NF).

2.) Suggestions by Reynolds (1983) and others for managing the goshawk by protecting nest stands with uncut buffer zones have failed to protect nesting pairs studied in Arizona. Crocker-Bedford (1990) has shown in an experiment on the Kaibab National Forest that managing goshawks by creating buffer zones around nest sites even up to 500 acres did not maintain breeding pairs of goshawks in harvest areas. Even if birds returned to a harvested locale for a few years after harvest, productivity plummeted and eventually occupancy rates dropped off. Such losses were attributed to possible declines in prey base affecting the energetics of the goshawk, and competition by other open forest raptors for nest sites.

There is growing recognition that new management strategies in addition to nest stand protection need to be developed in order to maintain viable populations of forest interior species such as the goshawk in timber base areas. For a review of recent management recommendations see following **Section IV.**

Suggested future work on habitat data relating to nesting goshawks on the Targhee could include:

--a comparison of goshawk nest stand data presented here to stand data collected by Forest personnel for the same areas to see if significant differences exist. If projections of goshawk habitat use are to be based on Forest stand data in later planning, it should be determined if such stand data is specific enough to identify existing potential goshawk nesting stands within a sales area. If not, more field work might be required for specific area evaluations.

--a study of habitat in the home range area of known goshawk pairs in order to better understand their habitat needs. As radio-tracking individual birds is costly and extremely time consuming, analysis of estimated home range areas may prove to be much more useful in determining local

habitat needs. (See page 31 below for a description of such an analysis by Crocker- Bedford, 1991).

III. MONITORING THE NORTHERN GOSHAWK, SUMMARY OF DATA COLLECTED, 1980-1990 TARGHEE NF

A. METHODS

1. Determination of Nesting Territories

Thirty-four goshawk nesting sites and/or clusters thought to represent 34 separate breeding territories have been located on the Targhee National Forest between 1980-1990. (Appendix Table VII lists each territory along with location, years active, productivity, and confirming observation.) I have included 10 additional territories to those listed in last year's report: six new sites found in 1990, and four locations where inactive nests have been located. These last four nest locations (Miner's Creek, Pete Creek, Taylor-Carrot, and Long Gulch) were found originally in undisturbed habitats with tree density and canopy cover characteristic of goshawk nesting stands. One to two intact, typical goshawk stick nests (nest located beneath the canopy against the tree bole) were found at each location. The stand at Pete Creek was subsequently harvested but the other three remain undisturbed. No goshawks have used these nests in the years monitored but I am confidant from inspection of the areas that they should be included in the list of goshawk territories.

All 34 identified nesting territories located are a minimum of 2 miles from known neighboring territories with most located at even greater distances apart. (Note: no surveys have been made of areas in between territories.) From 0 to 5 alternate nests have been located per territory. Locations of alternate nests within the individual territories range from 100 ft up to .7 mile from each other. Based on current goshawk research (see citings below), its seems reasonable to classify nest sites or nest clusters found greater than 2 miles apart on the Targhee NF as separate breeding territories even though individual birds have not been color banded or radio tracked.

In the most thorough study to date of alternate nest use by goshawks, Woodbridge determined by color marking goshawks in northern California that alternate nesting stands for the same pair occur at a median distance of 777 ft (237m) apart or nearly the radius of a 50 acre circle. Almost a quarter of his pairs nested at even greater distances but 1.7 miles was the largest recorded distance between alternate nests (Woodbridge, 1988). In Arizona, alternate nests within the same territories were found within 1000 m (.6 mile) of each other while nests of adjacent territories averaged 2.6 km or 1.6 miles apart (Crocker-Bedford, 1990, p. 263).

2. Analyzing Monitoring Data

To attempt to summarize and accurately evaluate goshawk monitoring results collected over the past ten years for these 34 nesting locations and to determine occupancy rates and goshawk densities on the Targhee Forest presents some major difficulties even though the quantity and quality of goshawk data available appears to exceed that collected on most other National Forests where the goshawk occurs. Interpretation of occupancy rates is complicated because:

-- nests sites were not checked every year

-- intensity of nest searches varied between sites and years

-- the average number of alternate nests located per territory is low indicating that all existing alternate nests have not been located for most territories.

-- known alternate nests have been located over a period of years

-- some sites are known to be active but actual nest trees have not been located

-- different people checked nests in different years and seasons over the decade and recorded results differently

-- nests were often found in active timber cutting areas

Considering difficulties with the monitoring data, I spent a great deal of time deciphering and interpreting data from years prior to 1988 in order to identify accurately the location, number of nest sites, and management activities for each identified nesting locale. I then used three different and separate methods of analysis to interpret available data. First, I rated locales as to whether I thought they were still active, inactive, or need more monitoring. Second, I calculated occupancy and productivity rates for non-harvest and harvest locations for the years 1988-1990 when efforts were made to check most known nest sites. Third, I calculated reoccupancy rates for all nest clusters monitored between 1980 and 1990 with clusters classified into non-harvest, 1970-79 harvest, and 1980-89 harvest locales. Included in this final analysis is a calculation of "adjusted" reoccupancy rates to attempt to compensate for the difference in number of known nest sites per locale.

B. RESULTS: GOSHAWK MONITORING 1980-1990, TARGHEE NF

Table 4 presents yearly monitoring results for all 34 identified goshawk nesting territories. Compared to a similar table in last year's report, much more effort has gone in to defining exactly

TABLE 4. GOSHAWK NEST CLUSTER YEARLY MONITORING SUMMARY, 1980-90 Targhee NF

#	LOCATION	YEARLY NEST CHECKSa:										YEAR of HARVESTb
		1980a	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
1.	Divide Creek											A*	none
2.	Fritz Creek									A*	A*/N	A*/N	none
3.	South Fork Deep Creek					P/N	x				x	x	none
4.	South Three Mile Creek				A	x	x			x	x	A	1991
5.	East Rattlenake Salvage Sale				A	x	x			x	x	x	1990
6.	Sheep Creek Elk Transect						A		P	x	x	A	1971-79
7.	Pete Creek TS Unit 9						N			s			1985
8.	Miner's Creek											N	proposed
9.	Alex Draw TS Unit 17A				A-1	x	x			x	A	GG	1987
10.	East Steel Creek TS Unit F									A-3	x	GG	1989
11.	Kay Creek Timber Sale Unit 21										A	A	1990
12.	Walking Fish TS Unit 9										A	GG	proposed
13.	Taylor-Carrot TS Unit 50									GG	x	GG	1989-91
14.	Dry Canyon (Icehouse TS)											A	proposed
15.	Staley Springs											A	none
16.	Polebridge											A	1987,proposed
17.	N. Antelope		GG	x	x	x	x	x	x	x			1978,81
18.	Eccles Rd. Unit 104-10						A	x	x	x			1985,85
19.	Anderson Mill TS		A							s			1970's,87
20.	Fall River Ridge										A	x	1976-78
21.	MA 12 Sale Area Unit 326-11										A	CP	proposed
22.	Dry Cr. TS Unit 22/24	A	A	x	P		x	D					1985
	Dry Cr. TS II Unit 9							A					1986
23.	Dry Cr.II Unit 20 (Teepee Cr)						A	GG	B/s	x	x		1987
24.	Pole Canyon Unit 23								A-3	s	s		1985-86
25.	Bustle Creek											A*	none
26.	Grandview TS Nest #1		A	x	x			x	x	x		x	1986
	Grandview TS Nest #2			A	x			D	(tree | cut)			1986
	Grandview TS Nest #3							A	x	x			1987
27.	Canyon Cr. TS Unit 245/20							A*	s		B	s	1989
28.	Canyon Cr. TS Unit 247/12								A		A*	A	1991
29.	Kirkham Hollow TS Unit 246/17									A*	s		1989
30.	Gooseneck TS											A	1990-91
31.	Ruby Cr. Argum R. TS Unit 17							A-1		x	A	x	1989
32.	Rocky Canyon							A		A*	x	A	none
33.	Water Canyon					A	x	x	D				(burn 87)
34.	Long Gulch						N				x	x	none

FOOTNOTES:

a. Yearly Nest Checks: A active nest located, A-# indicates # of nestlings per site if known prior to 1989
A* active site--fledged goshawks seen, no specfic nest located
P probable active nest site; adult heard calling
B adult goshawk seen in area during breeding season
N goshawk nest found, not active
x nest checked between June-August
s area checked; not a specific nest
D nest tree desroyed
GG great gray owl used nest
CP Cooper's hawk used nest

b. Year of Harvest: lists years of actual timber harvest in nest area.
"proposed"--nest site in proposed timber sale area

both monitoring efforts and results (see key at bottom of table). Results are classified as to whether an active nest or inactive nest was found, if adults and fledged goshawks were seen, or if other species occupied the nest itself. Monitoring efforts are rated as either specific nest visits or general searches in an area of known goshawk activity. Also given is the year, if any, that timber harvesting occurred or will occur in the vicinity of a nesting cluster.

1. First Analysis: Status of Known Nesting Locales

Table 5a and 5b classify all known nesting sites (not including #33 Water Canyon which was burned out) into seven different status categories indicating the level of timber harvesting that has or will occur at a location and whether or not the site is active or will remain active. Data for timber harvest locations include size of any buffer zones created around nest sites, acres of timber harvested if known, and proposed future timber harvests. Definitions for the status classifications used are:

TABLE 5a:

UNHARVESTED SITE: ACTIVE--nest site/cluster has been active in 1989 or 1990 and no major timber sales activity has occurred or is proposed in these areas. (5 locales)

UNHARVESTED SITES: ASSUMED ACTIVE-- intact nests have been found during the past decade at these sites but no activity has been recorded in the specific years nests checks were made. As these sites are located in large undisturbed areas, it is assumed that goshawks can and will still use such areas in the future. (2 locales)

POST-HARVEST AREAS: ACTIVE--active nests have been found at these post-harvest sites during 1989 or 1990. Dates of harvest are given in the table. (3 locales)

POST-HARVEST AREAS: NEED TO BE MONITORED--these sites are located in timber harvest areas but buffers of uncut timber have been left around known nests (see table). No post-harvest nest activity has been recorded. Monitoring is needed to determine future site status. (4 locales)

PROPOSED HARVEST SITES: NEED TO BE MONITORED--these sites have all been located in areas proposed for harvest in the first half of 1990's. Sale planning and environmental assessments have not been completed. Future monitoring is needed to determine site status. (5 locales)

TABLE 5b:

POST-HARVEST SITES: INACTIVE--nest site/clusters are located in harvested sale units. No buffer zones or buffer zones of less than 10 acres were left around known nest sites. Buffers which were created do not connect to larger untreated forest stands. No records of active goshawk nesting sites exist post harvest at these locales. (9 locales)

TABLE 5a. GOSHAWK NESTING LOCALES: STATUS AND MANAGEMENT ACTIVITY, 1980-1990 Targhee NF

LOCATION	SIZE OF BUFFER? (ACRES)	MANAGEMENT ACTIVITY
UNHARVESTED SITES: ACTIVE		
1. Divide Creek		proposed wilderness area
2. Fritz Creek		proposed wilderness area
15. Staley Springs		none
25. Bustle Creek		resort expansion proposed 1 mile to west
32. Rocky Canyon		south fork Snake River Management Area
UNHARVESTED SITES: ASSUMED ACTIVE		
3. South Fork Deep Creek		none
34. Long Gulch		timber sales cancelled mid-1980's
POST-HARVEST AREAS: ACTIVE		
6. Sheep Creek Elk Transect		Sheep Creek TS 1971-79 1020 ac overstory removal
9. Alex Draw TS Unit 17A	10+	Alex Draw TS 1987, buffer connects to 90 ac uncut habitat
20. Fall River Ridge		Fall R TS 1976-78, 1500 ac clearcut, large uncut stands along ridge
POST-HARVEST AREAS: NEED TO BE MONITORED		
10. East Steel Creek TS Unit F	10+	E. Steel Creek TS 332 ac, 1989, buffer connects to 130 ac uncut habitat
19. Anderson Mill TS		80 ac nest stand, adjacent unit clearcut pre 1980, 1987-91 991 ac cut
30. Gooseneck TS	384	Gooseneck TS 80 ac 1990-91, nest unit dropped
31. Argum R. TS Unit 17		Argument Ridge TS 242 ac, cut 12/89 within 1/4 mile of nest
PROPOSED HARVEST AREAS: NEED TO BE MONITORED		
8. Miner's Creek	?	proposed sale 1100 acres, 1992-93
12. Walking Fish TS Unit 9	?	Walking Fish TS proposed 500 acres 1992, nest unit dropped
14. Dry Canyon (Icehouse TS)	?	Icehouse TS proposed 2422 ac sales area 1992, 580 acres cut 1978
16. Polebridge	130?	proposed 350 ac harvest 1992-93, nest stand dropped from sale
21. MA 12 Sale Area Unit 326-11	?	unit dropped 1989 from sale, sale status unknown

*NOTE: see text for explanation of sub-headings

TABLE 5b. GOSHAWK NESTING LOCALES: STATUS AND MANAGEMENT ACTIVITY, 1980-1990 Targhee NF

	LOCATION	SIZE OF BUFFER (ACRES)	MANAGEMENT ACTIVITY
POST-HARVEST SITES: INACTIVE			
7.	Pete Creek TS Unit 9	2-3	Pete Creek TS, unit cut 1985, 350 ac proposed 94-95
17.	N. Antelope	2	adjacent units clearcut 1978, 1981, small buffer next to road
18.	Eccles Rd. Unit 104-10	2	area clearcur 1984, firewood 1985, 2 acre buffer
22.	Dry Cr. TS (Morris Cr)	none	Dry Cr II TS 1442 ac cut 1983-87, 1 nest cut 1985, 1 buffered 1986
23.	Dry Cr.II (Teepee Cr)	1-2?	see above, unit cut 1987, unit boundary moved back to save tree
24.	Pole Canyon Unit 23	none	Pole Can TS 74 ac cut 1980-83, 287 ac cleaned 1985-86
26.	Grandview TS Nest #1-3	2	Grandview II TS 884 ac 1986-87; Grandview I 471 ac 1990
	Grandview TS Nest #2	lost	
27.	Canyon Cr. TS Unit 245/20	none	Canyon Cr TS 545 ac, unit cut 1990, no nest located
29.	Kirk. Holl. TS Unit 246/17	none	Kirkham Hollow TS 544 ac, unit cut 1989, no nest located
TO BE HARVESTED SITES: ASSUMED WILL BECOME INACTIVE			
4.	South Three Mile Creek	few trees?	E. Rattlesnake II TS, units 1&2 to be cut 1991, prop. 400 ac 1995-96
5.	East Rattlenake Salvage	few trees	E Rattlesnake II TS 650ac total, cut 90-91, also Bear Corral TS
11.	Kay Creek TS Unit 21	few trees	Kay Creek TS 700-900 ac, 1989-90,3 nest trees in unit saved
13.	Taylor-Carrot TS Unit 50	few trees	Taylor-Carrot TS 320 ac, 1989-91
28.	Canyon Cr. TS Unit 247/12	few trees	unit to be cut 1991, attempt to negotiate buffer

*NOTE: see text for explanation of sub-headings

TO BE HARVESTED SITES: ASSUMED WILL BECOME INACTIVE--these sites are located in sold timber sale units that will be cut in 1990- 91. The nest trees and some trees around them have been marked as save trees. It is assumed that future monitoring will find reduced or no goshawk use of these sites post-harvest. (5 locales)

It can be seen from Tables 4 and 5 that a majority of nesting locales have been found in timber harvest areas. Only 7 (20%) have been located in non-harvest areas, 19 (56% in areas harvested 1990-1991, 2 (6%) in areas harvested 1970-1979, and 5 (15%) in proposed timber sale areas. One nest (3%) was lost to forest fire.

Out of 34 identified nesting locales, 10 (29%) are active or assumed to be. These ten are located in areas where no additional timber sales activities are proposed under the current Targhee NF Land Management Plan. A total of 14 out of 34 locales (41%) are believed inactive or will become so due to past or future timber harvest activity. Another 9 out of 34 (26%) need to be monitored in the future to determine if the locales remain active.

2. Second Analysis: Occupancy and Productivity Rates, 1988-1990

The second analysis is an assessment of the effect of timber harvesting which occurred during the 1980's in actual nesting stands. This analysis uses data collected on nest occupancy in 1988 through 1990 only when an actual monitoring program took place. **All checks made during the three years at every known nesting locale for which an actual nesting stand or stands had been identified were tallied and percent of active locales and productivity per locale calculated.** (Not included are: **1.** Divide Cr., **19.** Anderson Mill, **22.** Dry Cr. TS, **24.** Pole Canyon,and **33.** Water Canyon.)

Each nesting locale was counted as a single unit no matter how many alternate nests per location were checked. Locales were classified into "**undisturbed/pre-harvest**" (N=22) and "**post- harvest**" (N=7) areas.

"**Post-harvest**" locales are those stands monitored after harvesting took place within the nesting stand itself during the 1980's. "**Undisturbed/pre-harvest**" locales experienced no actual timber harvesting prior to the monitoring period but pre-harvest activities such as tree and unit marking during the 1980's occurred at some of them. At two of these "**undisturbed/pre-harvest**" locales (Sheep Cr. and Fall River Ridge), harvesting outside of currently active nesting stands took place in the 1970's.

Table 6 presents a summary and tabulation of results. Over the three years considered, a total of 43 checks were made at "**undisturbed/pre-harvest**" locales of which 51% were found active with an average productivity of 2 birds per nest. For 11 "**post- harvest**" locale checks, only one site was found active resulting in a 10 % occupancy rate for such locales over the three year monitoring period.

TABLE 6. OCCUPANCY RATES: UNDISTURBED, PRE-HARVEST & POST-HARVEST GOSHAWK NES

LOCATION	NEST CHECKSa: 1988	1989	1990		
I. UNDISTURBED AND PRE-HARVEST NEST SITES:					
1. Fritz Creek	A	A-2	A-2		
2. S.F. Deep Creek		x	x		
4. S. Three Mile Creek	x	x	A-3		
5. E. Rattlesnake	x	x			
6. Sheep Creek	x	x	A-3		
8. Miner's Creek			x		
10. E. Steel Creek	A-3	x			
11. Kay Creek		A-3	A-2		
12. Walking Fish TS		A-1	x		
13. Taylor-Carrot TS	x	x	x		
14. Dry Canyon			A-3		
15. Staley Springs			A-3		
16. Polebridge			A-1		
20. Fall River		A-3	x		
21. MA 12 TS		A-1	x		
25. Bustle Creek			A-2		
28. Canyon Creek TS 247/12		A-1	A-2		
29. Kirkham Hollow TS	A				
30. Gooseneck TS			A-2		
31. Ruby Creek	x	A-0	x		
32. Rocky Canyon	A	x	A-3		
34. Long Gulch		x	x		
# SITES CHECKED:	9	15	19	TOTALS:	43
# SITES ACTIVE:	4	7	11		22
PERCENT ACTIVE:	44%	46%	58%		51%
AVERAGE PRODUCTIVITY:	NA	1.6	2.4		2.0
II. POST-HARVEST NEST SITES: (harvest occurred within nest stands)					
7. Pete Creek	x				
9. Alex Draw	x	A-3	x		
10. E. Steel Creek			x		
17. N. Antelope	x				
18. Eccles Road	x				
23. Teepee Creek	x	x			
26. Grandview	x		x		
# SITES CHECKED:	6	2	3	TOTALS:	11
# SITES ACTIVE:	0	1	0		1
PERCENT ACTIVE:		50%			10%
AVERAGE PRODUCTIVITY:		3.0			

NOTES: Nest check symbols A-1 active site with number of fledged young
x nest stand checked, no active nest found

The 10% occupancy rate for "**post-harvest**" locales may suggest a higher rate of occupancy than actually is occurring at the known nest locations harvested during the 1980's. After initial site surveys in 1988, 3 nesting locales (N. Antelope, Eccles Road, and Pete Creek) were dropped from the monitoring program as they are in areas of extensive habitat loss. Also, priority was given in the following years to sites thought most likely to be active.

The only "**post-harvest**" locale which was active during the 3 year period (Alex Draw) has a 10 acre buffer zone containing the known nest tree connected to a large (approx. 90 acres) untreated stand of timber. Out of the other six "post-harvest" locales checked, only E. Steel Creek which was harvested in 1989 has nest buffers which connect to over 100 acres of untreated forest habitat. The others have little or no buffers. (See **Table 5a&b** for description.) Four of these seven "post-harvest" locales were in Douglas fir stands (Pete Creek, Alex Draw, E. Steel, and Grandview), two were in pure lodgepole pine (N. Antelope, Eccles Rd.) and one in mixed lodgepole and fir (Teepee Creek).

3. Third Analysis: Reoccupancy Rates 1980-1990

For the third method of analyzing monitoring results, I considered all **rechecks made of actual known nest sites over the entire 10 year period** at "NON-HARVEST" (N=4), "1970-79 HARVEST" (N=2), and "1980-90 HARVEST" locales (N=15). "HARVEST" locales from 1980-90 were further divided into "pre-harvest", "during harvest" and "post-harvest" monitoring periods. A locale was classified as a "HARVEST" area if cutting took place or was being planned within 1/4 mile of identified nest sites. Nest checks for a locale were counted for all years **after the initial year an active nest site was discovered.** Not included in this analysis are 13 locales where no specific nests have been found or where active nests were first located in 1990. Results are presented in **Tables 7 and 8.**

Reoccupancy rates for each category of nest locale were calculated by dividing the number of years a locale was found active by number of years that locale had been checked. This is called the **"actual"** reoccupancy rate. An **"adjusted"** reoccupancy was also calculated to compensate for the fact that the number of known alternate nests checked differed between locales. Crocker-Bedford determined for his control nest clusters on the Kaibab NF that the yearly probability of recording an occupied nest in a territory roughly tripled with an increase in known nest trees from 1 to 3 (1990, p 264).

Based on his findings, I made the assumption that each locale should have an average of 3 alternate nests. I then compared the actual number of nests checked per locale per year to the number of nests that would have been checked assuming the existence of 3 nests per locale. An "adjusted" reoccupancy rate was then calculated by multiplying the "actual" rate by the ratio of nest checks assuming 3 nests to the actual number of nest checks made per locale. (Note: if more than 3 nests were found at a locale, then this higher number was used also in calculating "adjusted" reoccupancy rates.)

Following is a summary of data presented in **Table 7** (NON- HARVEST LOCALES, AND 1970-

TABLE 7. REOCCUPANCY RATES: GOSHAWK NEST SITES IN NON-HARVEST AND 1970-79 HARVEST LOCALES 1980-1990
Targhee National Forest

LOCATION	#KNOWN NEST TREES	#YEARS SITE CHECKS	#YEARS SITE ACTIVE	#Checks X #NESTS	#Checks X 3 NESTSa
NON-HARVEST SITES:					
Fritz Creek	1	1	1	1	3
	2	1	1	2	3
South Fork Deep Creek	1	3	0	3	9
Rocky Canyon	1	2	1	2	6
	2	1	1	2	3
Long Gulch	2	2	0	4	6
TOTALS:		10	4	14	30

REOCCUPANCY RATE (ACTUAL):	4/10=40%
REOCCUPANCY RATE (ADJUSTED):	40% x 30/14=86%

1970-1979 HARVEST SITES:					
Sheep Creek Elk Transect	1	2	1	2	6
	4	1	0	4	4
	5	1	1	5	5
Fall River Ridge	3	1	0	3	3
TOTALS:		5	2	14	18

REOCCUPANCY RATE (ACTUAL):	2/5=40%
REOCCUPANCY RATE (ADJUSTED):	40% X 18/14=51%

a. assume an average of 3 nests per site; see text for explanation

TABLE 8. REOCCUPANCY RATES: GOSHAWK NEST SITES IN TIMBER SALE LOCALES, 1980-1990 Targhee NF

	PRE-HARVEST					DURING HARVEST					POST-HARVEST				
LOCATION	#NEST TREES CHECKED	#YEARS SITE CHECKSa	#YEARS ACTIVE	#CHECKS x #NESTS	#CHECKS x 3 NESTSb	#NEST TREES CHECKED	#YEARS SITE CHECKSa	#YEARS ACTIVE	#CHECKS x #NESTS	#CHECKS x 3 NESTSb	#NEST TREES CHECKED	#YEARS SITE CHECKSa	#YEARS ACTIVE	#CHECKS x #NESTS	#CHECKS x 3 NESTSb
1980-91 HARVEST SITES:															
South Three Mile Creek	1	5	1	5	15										
East Rattlesnake Salvage	1	5	0	5	15										
Alex Draw TS Unit 17A	1	2	0	2	6						1	3	1	3	9
East Steel Creek TS Unit F	2	1	0	2	3	2	1	0	2	3					
Kay Creek TS Unit 21	3	1	1	3	3										
Walking Fish TS Unit 9	2	1	0	2	3										
Taylor-Carrot TS Unit 50	2	2	0	3c	6										
N. Antelope											1	7	0	7	21
Eccles Rd. Unit 104-10											1	3	0	3	9
MA 12 TS Unit 326-11	1	1	0	1	3										
Dry Cr. TS (Morris Cr.)	1	4	2	4	12	2	1	1	2	3					
Dry Cr.II TS (Teepee Cr)	1	1	0	1	3						1	2	0	2	6
Grandview TS	2	2	1	2	6	2	2	1	4	6	1	1	0	1	3
Canyon Creek Unit 247/12	1	2	2	2	6										
Ruby Creek	1	2	1	2	6	1	1	0	1	3					
TOTALS:	29		8	34	87		5	2	9	15		16	1	16	48

REOCCUPANCY RATE (ACTUAL):	8/29=28%	2/5=40%	1/16=6%
REOCCUPANCY RATE (ADJUSTED):	28% x 87/34=72%	40% x 15/9=67%	6% x 48/16=18%

a. checks include nest surveys made in years following first discovery of active nest site in locale.
b. assumed average number of nests per locale; see text for explanation
c. only 1 nest checked in second year

79 HARVEST LOCALES) and **Table 8** (1980- 90 TIMBER SALE LOCALES):

REOCCUPANCY RATES

NEST SITES (N)	ACTUAL	ADJUSTED
Non-Harvest (N=4)	**40%**	**86%**
1970-79 Harvest (N-2)	**40**	**51**
1980-90 Harvest:		
Pre-Harvest (N=13)	**28**	**72**
During-Harvest (N=4)	**40**	**67**
Post-Harvest (N=5)	**6**	**18**

The "actual" reoccupancy rates for "NON-HARVEST", "1970-79 HARVEST", and "1980-90 DURING HARVEST" sites are all similar at 40%. The "1980-1990 PRE-HARVEST" "actual" rate is somewhat lower at 28% but this difference disappears when number of alternate nests are compensated for in the "adjusted" reoccupancy rate. The resulting reoccupancy rates of 72% and 67% respectively for the "1980-1990 PRE-HARVEST and DURING HARVEST" sites compared to the "NON-HARVEST" site rate of 86% reflect findings from the Kaibab NF that disturbance before and during timber operations does not greatly affect nest occupancy (Crocker-Bedford, 1990, p.265).

Compared to the "NON-HARVEST" "adjusted" reoccupancy rate of 86%, the "1970-1979 HARVEST" site rate of 51% suggests some effect of past harvest activity at these sites even though goshawks continue to nest in existing untreated stands left in these older post-harvest areas in some years. (One note of caution: the reoccupancy rate calculated here should not be used to extrapolate what might have occurred at other harvest areas during the 1970-79 period. No surveys for goshawks were undertaken during the 1970's. The two sites reported here were found in the following decade years after timber harvest occurred and had not undergone further harvesting.)

What is most striking in the above table is the greatly reduced reoccupancy rates for "1980-1990 POST-HARVEST" sites with a 6% "actual" and an 18% "adjusted" rate compared to the other categories. The "adjusted" rate also is probably lower than calculated here as I have assumed that 3 alternate nests still exist and that none were lost during harvest at these locales. Two of these "POST-HARVEST" sites were in Douglas fir stands (Alex Draw, Grandview), two were in pure lodgepole pine (N. Antelope, Eccles Rd.), and one in mixed pine and fir (Dry Cr).

The reoccupancy rate calculated for "1970-79 HARVEST" sites should not be used to suggest

increasing reoccupancy rates in the "1980-90 POST-HARVEST" locales over the next decade from 18% to over 50%. The two 1970-79 locales analyzed (Sheep Creek and Fall River Ridge) are located in very productive areas near riparian zones with an excellent diversity of habitat types. Also, timber harvest methods especially in Douglas fir habitats have changed over the past 12-15 years as to how many and what kinds of trees are left. At both "1970-79 HARVEST" locales analyzed here, large stands of mature Douglas fir were left uncut where active nests are now located. More extensive analysis of existing habitat at all known post-harvest locales needs to be undertaken before extrapolations from earlier harvest areas can be made to predict future goshawk use in the "1980-90 POST-HARVEST" areas.

For this third analysis, comparisons of productivity rates (number of young produced per year) between "NON-HARVEST" and "HARVEST" locales have not been made as very little productivity data exists prior to 1989 for active goshawk nests.

To summarize, this last analysis shows a 75% reduction in "adjusted" reoccupancy rates in "1980-90 POST-HARVEST" nesting sites compared to "1980-90 PRE-HARVEST" sites in surveyed harvested locales on the Targhee NF (18% vs 72% reoccupancy). If the "1980-1990 POST-HARVEST" rate is compared to the "NON-HARVEST" rate, the percent reduction calculated increases to 80% (18% vs 86% reoccupancy). Also, comparing the two known locales harvested in 1970-79 to "NON-HARVEST" locales, a 40% reduction in reoccupancy is calculated (51% vs 86%). It should be noted that these reoccupancy rates apply only to sites where nest trees have been located and saved. If the sites where nest trees have been cut (see **Table 5b**) were included in such calculations, the percent reoccupancy in post-harvest areas would be lower for the past decade.

C. DISCUSSION: MONITORING DATA 1980-1990

1. Status and Occupancy of Known Goshawk Nesting Locales

All three analyses of known goshawk nesting locales presented above demonstrate reductions in occupancy of identified nest sites located in timber sale areas on the Targhee NF during the past decade even though management guidelines exist to protect known nest sites. The first analysis indicates that 41% of nesting locales identified over the past decade are now inactive and another 26% are possibly affected and need more monitoring. The second analysis, looking at data collected during the last three years, shows an occupancy rate of 51% at undisturbed locales compared to a 10% occupancy at post-harvest locales. The third analysis, a compilation of data collected over the past decade, suggests decreases in post-harvest locale reoccupancy rates of 75-80% in locales harvested during the past decade.

The Targhee NF's ***Timber-Wildlife Coordination Guidelines*** specify that a 10 acre buffer be managed around accipiter nests in which the character of the stand be maintained, and, also, that a forested environment adjacent to at least portions of the buffer areas of accipiter nests be

maintained to provide hunting habitat (*FSM 9/79 TNF Supp 2, 2630.3*, p. 3). Prior to 1989, when a contracted goshawk monitoring program began, most goshawk nests were discovered in timber sale areas only after sales units had been sold, making it impossible in most cases to create specified buffer zones around nest trees (see **Table 5a&b**). At 4 nesting locales harvested between 1980-90, no nest trees were saved. At 13 other locales scheduled for harvest from 1980 through 1991, nest trees buffers were created but only 3 of these actually meet the minimal management guidelines for a 10 acre buffer adjacent to a forested environment: Alex Draw, E. Steel Creek, and Goosesneck. At the 10 other locales scheduled for harvest where nest trees were found prior to actual cutting, only a few trees or a few acres around nest trees were or will be saved.

Discovery of active goshawk nest sites in proposed timber sale areas in 1989 and 1990 resulted in sales units being dropped or modified to protect nesting areas (Walking Fish, MA 12, Polebridge, and Gooseneck). Designing experimental buffer zones around active nest locations, especially in areas which have lost previous nest sites due to timber harvesting could be an important element in an effective monitoring program for management indicator species (*pers. comm.*, Wini Sidle, USFS Habitat Management Coordinator). Designs for such buffer areas should include stands where the nest tree and alternate nests are located, replacement nesting stands, and adequate foraging habitat. (See **Section IV** for a summary of management recommendations from other National Forest areas.)

Goshawk nests will, of course, continue to be found in timber harvest areas after sale contracts have been sold. If maintenance of such nest sites is desired, perhaps contract clauses can be written to allow for greater flexibility in dealing with such situations. I would suggest that in all cases saving the nest tree and some forested habitat around it, even if inadequate for nesting goshawks, might still provide nesting habitat for other raptors which nest in more open habitat than the goshawk. Subsequent use of goshawk nests in logged areas by other raptors such as great gray owl, great horned owl, long- eared owl, red-tailed hawk, and Cooper's hawk has been documented in Oregon and Arizona (Bull, et al. 1988; Crocker-Bedford, 1990). Bull and Henjum (1990) specifically state that for managing the great gray owl: "Any tree with a stick platform, particularly old raptor nests, should be left standing with cover around the nest."

The loss of individual nest locales (containing 1 or more nest sites) naturally leads to the question of how the overall breeding territory of a pair of goshawks may be affected. Do losses of specific nest sites and nesting stands result in abandonment of a breeding territory? Whether a pair remains and breeds successfully within their home range probably depends on the extent and nature of habitat loss within the home range which determines the availability of replacement nesting stands and prey abundance.

In areas of extensive clearcutting in lodgepole pine habitat, loss of an entire breeding territory may be obvious. It is more difficult to assess the overall effect of selective harvesting in Douglas fir and mixed conifer habitats. From my own observations in locales where selective harvesting has occurred, it often appears that the stands selected for harvesting are the same mature, dense stands that characterize the highest quality goshawk nesting and foraging habitat. Often what are left are younger, more open stands that may not support nesting goshawks. An indication of how existing timber harvest programs may be selecting for the same stands that goshawks use is

the fact that alternate nests for known active goshawk territories have often been found within the same or adjacent sale units within a timber sale area. This has occurred at Dry Cr. Timber Sale (TS), Grandview, Canyon Cr., Rattlesnake, and E. Steel.

A recent analysis of goshawk data collected on the Kaibab National Forest by Crocker-Bedford (1991) tests the theory that creating buffers around nesting stands in timber harvest areas as suggested earlier by Reynolds (1983) will preserve nesting goshawk pairs. The study indicates that creating buffer zones in selective harvested area in Arizona did not preserve active nest sites. Compared to non-harvested controls, recorded reoccupancy rates dropped by 80% and nestling production by 94% following logging. This held true for both small buffers 1.2-2.4 ha (3-6 ac) and large buffers 16 to 200 ha (40-495 ac). The type of harvesting was selection or partial cuts in Ponderosa pine (*Pinus ponderosa*) and mixed conifer with removal of about one-third of the volume present on the typical harvested acre.

A reanalysis of data from the same study area presented at a recent meeting of the Wildlife Society clearly shows the relationship between the amount of harvesting which occurs within a goshawk home ranges and reductions in nest occupancy and productivity (Crocker-Bedford, 4/19/91, Northwest Section of the Wildlife Society Meeting, Silverdale, WA.). By analyzing the amount of selective harvesting which occurred within an assumed home range of 1.7 mile radius or 5800 acres around each nest cluster for 53 clusters, he shows that reductions in both occupancy and productivity exceed the percent of timber harvested in the home range.

Selective harvesting on one-fourth of the acres within the home range reduced nesting attempts by nearly one-half from 79% to 42%. Harvesting on one-half the acres reduced nesting attempts to 31%. Harvesting on three-fourths of the acres resulted in only 9% nest attempts. There was no significant difference between buffered or non-buffered nest clusters. Number of nestlings produced at analyzed sites was:

NO HARVESTING	**2.0 nestlings/nest**
ONE-FOURTH ACRES HARVESTED	**1.8**
HALF ACRES HARVESTED	**1.0**
THREE-QUARTERS HARVESTED	**0.0**

Why a much greater reduction in occupancy and productivity of goshawk breeding territories occurs than the percentage of timber harvested is thought to be related to the energetics of goshawk biology. It is perhaps best to quote the author himself from a letter written to Leon Fisher, chair of the Goshawk Scientific committee, USFS Region 3 (3/24/91):

> . . .It is conceivable that small changes in prey abundance and accessibility, relative to amounts for an entire home range, could have disproportionate effects on nutrition within that home range. Goshawks exhibit home ranges between 5,000 and 8,000 acres. . .It is possible that goshawks are unable to increase their home range sizes, hunting time, and search speed enough to fully compensate for decreases in prey abundance and accessibility. Efforts to increase home ranges, hunting time, and search speed, would tend to consume more energy, and beyond some point such increased energy use would exceed gains from additional prey capture.

More intense surveys of harvested areas are needed on the Targhee NF to determine the relationship between harvest acres and volumes, and reductions in goshawk breeding. Differences in habitat types and timber harvest methods make direct comparisons with results from the Kaibab NF difficult though decreases in occupancy rates reported from treated areas on the Targhee Forest appear to approach decreases found in harvested areas in Arizona of 80% or higher (Crocker-Bedford, 1990). By evaluating in greater detail nesting territory occupancy as it relates both to the percentage of timber harvested and percentage of remaining untreated stands within estimated home ranges, effective future management of the goshawk within timber management areas may be possible.

2. USE OF THE GOSHAWK AS A MANAGEMENT INDICATOR SPECIES

In the Targhee National Forest ***Five-Year Monitoring Report for the Land Management Plan (1981-1986)***, future action called for a determination if the goshawk is a practical indicator for mature and old growth habitat, and if specified methodology is appropriate as given in the Monitoring Plan. The 1989-90 monitoring program for goshawks on the Targhee NF demonstrates that timber harvesting affects goshawk occupancy at nest sites within harvest areas. The principal factors thought to be limiting goshawks in timber harvest areas are "the abundance and availability of the birds and mammals it preys upon and the availability of nest sites" (Region 3, Goshawk Scientific Committee, 1991).

Managing for the goshawk, an upper level predator, thus, also involves managing for the large number of prey species it depends upon. (See Patla, 1989 for a list of identified prey items on the Forest.) Given that timber management affects both nesting habitat and prey base, it seems that the goshawk serves as a valid and valuable management indicator species. Improved methodology using vocalizations to survey for goshawks, makes it feasible to monitor for the raptor in proposed harvest areas and other locations.

Questions which need to be next addressed include: How many breeding pairs presently exist on the Targhee Forest and what percentage of these pairs have been affected by logging?

a. Estimating Goshawk Breeding Pairs

Figures given in the Targhee NF ***Land and Resource Management Plan , Final EIS*** (1985, p.77-78) estimate an existing population of 90 pairs for 870,00 acres of mature mixed-fir habitat. This is a density of 1 pair/15 sq, mi or 9600 acres or .3 pair/1000 ha. Habitat suitability was not defined for the goshawk nor were specific habitat types indicated in the base acreage defined. A minimum viable population was estimated to be 36 pairs but again no parameters were given as to how this figure was derived or what the distribution of pairs should be across the Forest. Recent work in conservation biology suggests that a minimum of 60 pairs may be needed for long term minimum viable populations of birds such as the goshawk which do not randomly exchange mates from year to year (Reed, Doerr and Walters, 1986).

In order to estimate accurately the goshawk breeding population on the Forest, an extensive analysis (far beyond the scope of the present report) is needed. First, an estimate of high, moderate and low quality goshawk nesting and foraging habitat based on collected habitat data and current goshawk research needs to be made. Existing Forest stand data may not be specific or accurate enough to define such habitats. For instance, stand data may indicate an area of small diameter lodgepole pine but a few Douglas fir trees within such a stand may be providing goshawk nest habitat. Also, small clumps of older, larger trees within a younger strand may be areas of concentrated goshawk use. Comparisons of nesting habitat data collected for this study with existing Forest stand data for those same areas could help define how useful existing stand data is and where it may be deficient in identifying goshawk habitat. Perhaps updated forest inventories for the ongoing Forest plan revision may provide more detailed stand data. The configuration of existing stands (ie. amount of fragmentation) also needs to be taken into account. The past emphasis on goshawk use of mixed- fir habitat needs to be revised as well to include lodgepole pine and aspen stands.

The second part of any accurate population estimate should include inventories of goshawk breeding pairs in control study areas in Douglas fir, lodgepole pine, and mixed conifer habitats to establish a base figure for pairs per acre for different habitat types. With such density data and accurate habitat inventories, reliable estimates of goshawk breeding pairs Forest- wide could be made.

b. Timber Management and the Goshawk

In order to assess the impacts of timber harvesting during the present planning period on the goshawk population of the Targhee NF, I have compiled figures on total acres harvested (1980-89), total acres to be harvested (1991-1995), total acres to be managed as old growth, and number of goshawk nesting clusters located (1980-90) per management area and how many of these are located in 1980-95 timber sale areas (**Table 9**). Most management areas have not been surveyed or inventoried for goshawks. The majority of survey work during the past decade has occurred in MA 4, MA 15 and MA 16. A total of 61% (21 nest clusters) of the nests have been located in these management areas.

TABLE 9. TIMBER HARVEST ACRES 1980-1996, OLD GROWTH MANAGEMENT ACRES, AND GOSHAWK NEST CLUSTER STATUS, 1980-90

Targhee National Forest

MA	ACRES HARVESTED 1980-89a				ACRES TO BE HARVESTEDb 1991-1996	MANAGED OLD GROWTH ACRESc	GOSHAWK NEST CLUSTERSd		
	DF	LP	OTHER	TOTAL	TOTAL		# LOCATED TOTAL	# LOCATED HARVEST AREAS 1980-90	# LOCATED HARVEST AREAS 1991-96
1						766			
2					200	566			
3	6718	1227	682	8627	700	1506	3	0	
4	2730	604	284	3618	7011	4552	11	7	3
5						1036			
6		680	101	781	1520	1202	1	0	
7						493			
8		2137	3790	5927	1640	132			
9		25984	6710	32694	9272	430	1		1
10		11129	10457	21586	1191f	184	3	3	
11		1782		1782		1332			
12	573	3186	43	3802	2540	180	2		1
13						84			
14						4730			
15	86	8767	1076	9929	1222f	1640	4	3	
16	1266	4918	122	6306	2434f	793	6	6	
17		89	10	99		1580	1	0	
18						66			
19						4368	1	0	
20		107		107		480			
21	262	242		504		1480	1	0	
22		1170		1170	1300	278			
TOTALS:	11635	62022	23275	96932	29030	27878	34	19	5

NOTES: a. figures supplied by Hal Gibbs, Targhee forest biologist

b. figures taken from "Five-Year Cutting Budget and Sale Program", 14 JAN 1991 Targhee NF

c. taken from Targhee LMP. See sections for each management area.

d. see text for discussion of terms

e. includes only nest clusters located within harvest acres

f. acres listed in budget for 2 management areas have been divided between both

Considering all management areas, surveyed or not, the greatest number of nest clusters (32% of total) have been found in MA 4--the Douglas fir forests in the Centennial Mountains. The number of total acres harvested in MA 4 amounts to 4% of all acres harvested on the Forest during 1980-89. The next largest number of goshawk nest clusters, a total of 10, has been found in MA 15 and MA16 where 17% of total harvest acres occurred. Nest clusters there were found in mixed Douglas fir and lodgepole stands.

As seen from **Table 9**, harvesting in the 1980's on the Targhee NF has concentrated heavily (56% of total harvest acres) in lodgepole pine forests in the Island Park area (MA 9 and 10) yet only 4 goshawk nest clusters have been found there. Considering losses of mature timber due to mountain pine beetle infestations as well as harvesting which occurred before 1980, it is difficult now to estimate what the historic goshawk habitat might have been in these lodgepole pine forests. Because of the few goshawk nests located in lodgepole pine forests on the Targhee NF compared to the number found in Douglas fir habitat, lodgepole pine stands have not been considered in the past important goshawk nesting habitat. The percent of nests found in the lodgepole forests, however, would be much smaller for a number of reasons.

First, surveys for goshawks have been done in Douglas fir and mixed conifer habitat with few if any in lodgepole pine stands. Also, in clearcut harvests of lodgepole pine, only the outer boundaries of sales units are marked in contrast to Douglas fir sales which require individual tree marking so not much time is spent by Forest personnel within individual lodgepole pine sale units. I have also observed that lodgepole pine nests found on the Forest are much more unstable than nests built in Douglas fir trees which sometimes remain obvious for many seasons even if not reused. I have seen two active lodgepole pine nests fall apart almost completely by August of the breeding season which suggests that alternate or inactive nests will rarely be found outside of an active breeding year in lodgepole pine habitat.

The loss of mature, large diameter lodgepole pine stands with trees capable of supporting goshawk nests and reductions in associated forest species in the Island Park area probably severely limits goshawk breeding even in the remaining stands of pine. The recent discovery of an active nest at Polebridge indicates, however, that adequate prey may still be available in even intensively harvested lodgepole areas to allow for successful goshawk breeding if available nest trees and suitable stands exist. Surveys in lodgepole pine are needed in order to determine baseline densities for the goshawk and patterns of usage in previously harvested areas.

Included in **Table 9** are the number of acres proposed for timber harvesting in each management area over the next 5 years. If sales proceed as proposed, it should be anticipated that more goshawk nesting clusters will be affected. Of special concern is MA 4 where total acres to be harvested may double over the next 5 years compared to the number of acres harvested in the previous decade. Revised management guidelines for the goshawk may be needed in MA 4 and other management areas both in Douglas fir and lodgepole pine habitat where harvesting will be concentrated.

The other data presented in **Table 9** are the total number of acres to be retained over the rotation cycle for old growth management in each management area. Only three areas have more than 4000 acres set aside for old growth management, half of which would be younger

replacement stands. As the home range for goshawks has been estimated at over 7000 acres, it does not seem probable that current old growth management guidelines alone will insure that breeding pairs of goshawks will be maintained in heavily harvested management areas on the Forest.

To conclude, although the highest densities of nesting goshawks have been found thus far in mature and old growth stands of Douglas fir in the Centennial Mountains on the Targhee NF, it must be stressed that goshawks have been found throughout the forest in all types of existing mature forest stands including lodgepole pine, mixed conifer and aspen stands. As timber harvesting on the Targhee NF has been concentrated in certain management areas, review of management guidelines for maintaining goshawk nesting habitat may be required before the next plan revision if maintenance of the existing distribution of goshawk pairs throughout the Forest is desired.

IV. RECENT RECOMMENDATIONS FOR MANAGING THE GOSHAWK

A growing interest in goshawk management throughout the west is evidenced by the recent increase in information on goshawk management on National Forests in Montana, northern Idaho, Arizona, and Alaska. Following is a brief summary of recent literature which may provide suggestions for future management of the goshawk on the Targhee NF.

A. USFS REGION 1

Specific recommendations on old growth habitat management have been developed by Region 1 of the Forest Service. Material developed in regards to the goshawk is included in Appendix IV. Following is a summary of the habitat suitability model developed for the Northern Rocky Mountain Region (Warren, 1990):

1. determine whether at least two suitable nesting stands exist within a 5000 acre assessment area. Suitable stands are between 25 acres (minimum) and 125 acres (optimal) and exist within .6 mile of each other.

2. For feeding habitat at least 1500 acres of optimal and 6000 acres of marginal habitat should be available (see model for definition of habitat parameters).

3. To ensure population viability, suitable habitat for at least one pair within each 10,000 acre area should be provided .

B. KAIBAB NATIONAL FOREST, REGION 3

A recent paper summarizing data from the Kaibab National Forest suggests that creating buffer zones around located goshawk nests in timber harvest areas did little to preserve goshawk productivity even if buffers up to 500 acres were left intact. Crocker-Bedford recommends that

large blocks of dense habitat approximately 2500-5000 acres in size need to be maintained for foraging habitat and to prevent competition from open-forest and edge-benefitted raptors. Such objectives can be met, he suggests, by using an even-aged system of silviculture with the rotation length extended well beyond that which maximizes timber harvest. He does caution that even this proposal allows for more habitat change than what existed in his control areas in his goshawk study (1990, p.267).

C. INTERIM MANAGEMENT GUIDELINES, GOSHAWK SCIENTIFIC COMMITTEE, USFS REGION 3

A goshawk task force organized in Region 3 recently released interim guidelines on goshawk management aimed at protecting declining goshawk populations in the southwest (USFS, Region 3, 4/16/91). Final recommendations are expected by this summer. A major study funded for $600,000 under the direction of Dr. Richard Reynolds will also begin in 1991. The main features of the interim guidelines include:

1. Establish a post-fledgling family area (PFA) of 600 acres around all known nest sites and yet to be discovered nests within already planned or sold timber sale areas which includes all known nests.

2. Maintain a total of 3 known or potential nest sites of approximately 30 acres each of mature forest within the PFA. Also begin development of 3 replacement nest sites.

3. The PFA is to be managed so that it is mostly mature timber with approximately 10% in scattered openings with less than 10% canopy cover.

4. Within PFA's no vegetation or ground disturbance can occur between March and September 30.

5. Guidelines for managing foraging areas of 5400 acres around nest sites will be developed later this year. In the interim, forests, when planning timber sales, are encouraged to maintain reserve trees (dominate and codominate trees distributed in clumps with interlocking crowns) within foraging areas.

6. Monitoring of future sales areas should follow the draft survey protocol developed by Kennedy and Stahlecker (1991). Long-term monitoring of known goshawk territories is recommended.

D. TONGASS NATIONAL FOREST, ALASKA

Another intensive goshawk monitoring program will began this summer in Alaska in the Tongass National Forest studying the Queen Charlotte subspecies (*A. g.langi*). The Viable Population Committee of the Tongass NF recently released **"Recommended Standards for Maintaining Well Distributed, Viable Populations of Species Associated With Old-Growth Forest Habitats"** (2/12/91) which includes discussion of the goshawk.

It is recommended that large old-growth core reserve areas be established capable of supporting 8 pairs of goshawks. This is estimated to require 20,000 acres of high quality habitat over a 40,000 or larger acre area. The goal is to have large blocks of habitat 35 miles apart center to center. Smaller Habitat Conservation Areas (**HCA**) capable of supporting 3 pairs of goshawks would require 8,000 acres of high quality habitat over a 16,0000 acre area. These smaller areas would be no more than 8 miles apart edge to edge. Approximately 13% of the older forested habitat is to be maintained. The subcommittee also suggests protecting all pairs of goshawks found as the total population for the Queen Charlotte subspecies appears quite low and declining.

In reviewing the above management guidelines from different National Forest areas, it is obvious that a debate exists as to how large an area of untreated forest habitat needs to be left in order to preserve nesting pairs of goshawks and what the exact configuration of retained intact stands should be. It should be noted that all guidelines and recommendations, however, greatly exceed the 10 acre buffer area called for in the Targhee NF management guidelines.

V. CONCLUSIONS

Monitoring of the goshawk population on the Targhee NF confirms what has been found in other National Forest areas-- timber harvest activities in mature forest habitats affect goshawk nesting sites and appear to reduce the number and distribution of breeding pairs of goshawks on the Forest. It is suggested that future monitoring work on the Forest include:

--use of taped calls to monitor for goshawk breeding pairs during the nestling and post-fledge periods from mid-June to mid-August

--surveys by trained personnel using taped calls in all proposed timber sale areas for two years prior to unit sales

--continued searches for alternate nests in known nesting areas especially where future disturbances will occur

--inventories in undisturbed, control areas to determine goshawk densities and prey use in such areas

--more thorough inventories in post-harvest areas to determine goshawk use of such areas and affects of different methods and levels of timber harvesting

-- collection of more detailed information on prey use and foraging habitat. (Pellets collected in 1989 have been given to the Idaho State University Anthropology Department for analysis. Analysis of 1990 pellets will be arranged.) Use of blinds at active nest sites to record prey use and radio-tracking adults are other potential methods for gathering information on foraging habitat.

--habitat analysis of estimated goshawk home ranges in both undisturbed and timber harvest areas

--thorough analysis of goshawk habitat forestwide in order to estimate current and historic population levels

--consideration of listing the goshawk as a sensitive species for the Forest

In 1991, the goshawk monitoring project will concentrate on surveying in more detail 3-4 older, timber harvest areas where nest sites have become inactive to determine if goshawks might still be using these territories. This will involve identifying all remaining intact forested stands within 2 miles of former nest sites and surveying such areas between mid-June to mid-August. Survey areas will be located in the Big Hole, Teton, Centennial Mountain Ranges, and in the Polebridge/Big Grassy (MA 9) area. New proposed sale areas in Island Park are also to be monitored. As time permits, large undisturbed control areas will be designated for initial survey work.

As in 1990, all known historic nest sites on the Targhee should be rechecked by district biologists, especially those in timber harvest areas. More survey hours are needed also in proposed sale areas surveyed in 1989 and 1990, especially Miner's Creek, Walking Fish and Icehouse, in order to locate alternate nests and to survey acreage not yet covered. Kennedy and Stahlecker suggest that goshawk surveys in an area should be repeated for a minimum of two years in a row to adequately survey for goshawk territories and to avoid missing existing territories that may be unoccupied for a season (1991, p. 12).

It is recommended that if maintenance of the existing goshawk breeding population is desired then interim management guidelines for long-term protection of goshawk nesting sites within timber harvest areas be developed and implemented until new guidelines can be incorporated under the forest plan revision. The guidelines that exist at present, ten acre buffer zones around nests if found prior to sales, have not and will not maintain goshawk nesting sites.

VI. REFERENCES

Austin, Karen. 1991. Personal communication. Oregon State University, Corvallis, Oregon.

Bloom, Peter H., Glenn R. Steward and Brian J. Walton. 1986. The status of the northern goshawk in California, 1981-1983. Wildlife Management Branch Administrative Report 85-1. Calif. Department of Fish and Game, Sacramento, Calif.

Bull, Evelyn L., Mark G. Henjum and Ronald S. Rohweder, 1989. Diet and optimal foraging of great gray owls. ***J. Wildl. Manage.*** 53(1):47-50.

Bull, Evelyn L., Mark G. Henjum and Ronald S. Rohweder, 1988. Nesting and foraging habitat of great gray owls. *J. Raptor Res.* 22:107-115.

Crocker-Bedford, D.C. and B. Chaney. 1988. Characteristics of goshawk nesting stands, pp. 210-217. In R.L. Glinski et al, eds. ***Proc. Southwest Raptor Symposium and Workshop.*** Nat. Wildl. Fed., Washington, D.C.

Crocker-Bedford, D.C. 1990. Goshawk reproduction and forest management. ***Wildl. Soc. Bull.*** 18(3):262-269.

Crocker-Bedford, D.C. 1991. Goshawk reproduction at four amounts of selection harvest. Abstract of presentation to NW Section of The Wildlife Society, April 19, 1991, at Silverdale, WA.

Crocker-Bedford, D.C. 1991. Letter to Leon Fisher, Chair of Goshawk Scientific Committee, USDA Forest Service, Region 3. March 24, 1991. (Copy available upon request)

Hayward, Gregory, D. 1983. Goshawk nest habitat selection in the Northern Region. Wildlife and Fish Habitat Relationships Program. U.S Forest Service, Region 1, Missoula, Montana.

Kennedy, Patricia L. 1985. The nesting ecology of Cooper's hawks and northern goshawks in the Jemez Mountains, New Mexico, 1984 results. Sante Fe National Forest., New Mexico.

Kennedy, Patricia L. and Dale W. Stahlecker. 1991. Broadcast calls of the northern goshawk: their effectiveness and their use in inventory and long-term monitoring program. Report for USDA Forest Service, Southwest Region, Albuquerque, NM. Contract #43-8371-0-0583. 19pp+.

Kimmel, J. Timothy and Richard H. Yahner. 1990. Response of northern goshawks to taped conspecific and great horned owl calls. ***J. Raptor Res.*** 24(4):107-112.

Reed, J.M., P.D. Doerr, and J. R. Walters. 1986. Determining minimum population sizes for birds and mammals. ***Wildl. Soc. Bull.*** 14:255-261.

Reiser, Hildy. 1991. Personal communication. USDA Forest Service, Heber Ranger Station, Overguard, Arz.

Reynolds, Richard T. 1983. Management of western coniferous forest habitat for nesting accipiter hawks. For. Ser. Tech. Rep. RM-102.

Shuster, William. 1980. Northern goshawk nest site requirements in the Colorado Rockies. ***Western Birds*** 11:89-96.

Sidle, Winifred B. and L.H. Suring. 1986. Management indicator species for the National Forest lands in Alaska. USDA Forest Service, Alaska Region. Technical Publication R10-TP-2. Juneau, Alaska.

USDA. Forest Service. 1979. Forest manual direction for Wildlife-Timber Coordination, FSM 2600, May 1, 1979 (Sara Jane Johnson). Targhee National Forest Supp 2.

USDA. Forest Service. 1985. Land and resource management plan, Targhee National Forest. St. Anthony, Idaho.

USDA. Forest Service. 1985. Final environmental impact statement for the land and resource management plan. Targhee National Forest. St. Anthony, Idaho.

USDA. Forest Service. 1988. Five-year monitoring report for the land management plan. Targhee National Forest. St. Anthony, Idaho.

USDA. Forest Service. 1990. Old-growth habitats and associated wildlife species in the northern Rocky Mountains. Warren, ed. Northern Region Wildlife Relationships Program, Region 1.

USDA. Forest Service. 1991. Report of Viable Population Committee, Feb. 12, 1991 to IDT Leader, Tongass Land Management Planning. Interagency Biologist Committee on Viable Populations, USFS Alaska Regional Office and Dept. of Fish and Game, State of Alaska.

USDA, Forest Service. 1991. Northern goshawk summary interim management direction, Southwestern Region, April 16, 1991. Region 3, Albuquerque, NM.

Woodbridge, Brian. 1988. Territory fidelity and habitat use by nesting goshawks: Implications for management. Paper presented at the western section meeting of the Wildlife Society, Hilo, Hawaii, Feb. 10-13, 1988.

APPENDIX TABLES

NORTHERN GOSHAWK MONITORING PROJECT REPORT #2
1990

TARGHEE NATIONAL FOREST
St. Anthony, Idaho

Susan Patla
Independent Contractor
P.O. Box 505
Driggs, Idaho 83422

JULY 1991

(Location data on file at district offices; contact Forest Biologist if needed)

APPENDIX TABLE IA. GOSHAWK SURVEY SITES, 1990 DUBOIS DISTRICT (D-1)

DATE	SITE	TRS	TIME (hours)	OBSERVATIONS
06/18/90	District Office--Slide show		1	Lecture & discussion
06/18/90	Picnic Hollow		2	Nest check: no response to tape Red-tailed Hawk soaring in area
06/18/90	Sheep Creek Elk Transect		3	Nest check: Great Gray Owl near old goshawk nest, # 12 transect
06/26/90	Kay Creek TS Unit 21		2	Nest check: adult goshawk alarm calling near 1989 nest; nest empty
06/26/90	Alex Draw TS Unit 17A		3	Nest check: Great Gray Owl feathers, pellets under 1989 goshawk nest
06/26/90	E. Steel Creek TS		2	Nest check: Great Gray Owl feathers under 1989 goshawk nest
07/05/90	Kay Creek TS Unit 21		2	No goshawks seen; no response to taped recording
07/05/90	Miner's Creek TS		4	No goshawks seen; no response to taped recording
07/16/90	E. Steel Creek TS		2	2 fledged Great Gray Owls and 1 adult near nest
07/17/90	Kay Creek TS Unit 21		3	2 fledged goshawks at nest 300 feet from 1989 nest
07/17/90	Miner's Creek TS westside		5	No goshawks seen; no response to taped recording
07/17/90	Miner's Creek TS eastside		2	2 young Great Gray Owls food begging after sunset
07/18/90	Miner's Creek TS eastside		4	1 adult Great Gray Unit 1 3 fledged, 1 adult Great Gray Unit 17
07/18/90	Pete Creek Roads 010, 012		2	Check '89 sighting: no goshawks seen, no response to tape
08/02/90	Kay Creek TS Unit 21		3	2 fledged, 2 adults near nest -road building began in unit -habitat data taken
08/02/90	Moose Creek End of Road #564		3	No goshawks seen; no response to taped recording
08/03/90	SF Deep Springs nest site		2	Nest check: no goshawks seen, no response to tape
08/03/90	Fritz Creek nest site		4	1 fledged, 1 adult goshawk 2 inactive nests
08/04/90	Miner's Creek TS Units 2,7,5,17		8	No birds seen; no response to taped recording
08/05/90	Miner's Creek TS Units 5,6,17		5	2 inactive goshawk nests Unit 5, goshawk feather unit 6
08/14/90	Three-Mile TS, Unit		3	4 fledged Sharp-shinned Hawk 2 fledged, 1 adult goshawk
08/14/90	E. Rattlesnake		1	Check old nest location: nothing
08/23/90	Three-Mile TS, Unit		3	2 fledged goshawks calling, nest found
08/23/90	Sheep Creek Elk Transect		3	habitat data taken, gos calling
	TOTAL HOURS:		72	

APPENDIX TABLE IB. GOSHAWK SURVEY SITES, 1990 ISLAND PARK DISTRICT (D-2)

DATE	SITE	TRS	TIME (hours)	OBSERVATIONS
06/25/90	District Orientation Program		2	
07/04/90	Icehouse Timber Sale Westside Tom Creek		6	Cooper's Hawk nest, Tom Creek 1 defensive adult, whitewash
07/11/90	Icehouse Timber Sale Westside Dry Canyon		9	Goshawk responds to tape 2 defensive adults, Dry Can. 1 adult Great Gray Owl
07/12/90	Hotel Creek Timber Sale North of Rd. #48		9	No goshawks seen; no reponse to taped recording
07/13/90	Taylor-Carrot Timber Sale Unit 50, 51		4	Checked old nest; Great Gray Owl feathers, whitewash
07/18/90	Walking Fish TS Unit 9 Unit 9		3	Checked old nest; owl feathers and pellets; 2 fledged Great Gray owls and 1 adult
07/18/90	Icehouse Timber Sale Westside Dry Can.		3	Found goshawk nest Dry Can.; 3 in nest, adult female near
07/25/90	Icehouse Timber Sale Westside Tom Cr.		3	Tom Cr. 3 fledged Cooper's, another stick nest, unused
07/26/90	Icehouse Timber Sale Dry Can., Tom Creek		6	Dry Can. 3 fledged goshawks 3 fledged Cooper's hawks at nest
07/28/90	Ripley Butte Timber Sale Surveyed butte area		2	No goshawks seen; no response to taped recording
07/29/90	Hotel Creek Timber Sale North & south Rd. 48		9	No goshawks seen; no response to taped recording; juvenile Red-tailed Hawk food begging
07/30/90	Taylor-Carrot TS Unit 50,51		2	Np goshawks or owls seen
07/30/90	Kick Creek, west of Rd. 472 Old cut area		2	Check reported sighting N. Harrier responded to tape No goshawks seen
07/30/90	Icehouse TS Road #47 Eastside Tom Cr. drainage		3	Possible goshawk prey site Jay feathers, whitewash
07/31/90	Staley Springs, Henry's Lake		3	Check reported sighting Active goshawk nest; 3 fledged young respond to tape
08/13/90	Staley Springs nest site		7	Habitat data collected
	TOTAL HOURS:		69	

APPENDIX TABLE IC. GOSHAWK SURVEY SITES, 1990 ASHTON DISTRICT (D-3)

DATE	SITE	TRS	TIME (hours)	OBSERVATIONS
05/16/90	Fall River Ridge nest site		2	Check nest site; no activity
06/05/90	District Orientation Program		1	
06/19/90	Field Training, seasonals 1. Fall River Ridge nest 2. Hominy nest		8	Trained on visual and sound --Located old aspen stick nest --Cooper's Hawk at goshawk nest
07/12/90	Boundary Pond nest		1	Check old stick nest, collect owl pellets
07/26/90	Polebridge TS area Road 777		1	Confirm nest site report 1 fledged goshawk; 1 dead
08/13/90	Polebridge TS area		3	Habitat data collected
	TOTAL HOURS:		16	

APPENDIX TABLE ID. GOSHAWK SURVEY SITES, 1990 PALISADES DISTRICT (D-4)

DATE	SITE	TSR	TIME (hours)	OBSERVATIONS
04/18/90	Rocky Canyon nest South Fork, Snake River		3	Check nest site; adult in incubation posture
05/10/90	Long Gulch West of Rd. #059		4	Check 2 nests; no goshawks seen; no response to tape
06/10/90	Ruby Creek		1	Check nest; no goshawks seen; no response to tape
06/22/90	Rocky Canyon nest		3	3 young in nest; oldest approx. 2 weeks
06/25/90	District Orientation Program		1	
06/30/90	McGrath Exchange Land Palisades Resevoir		3	No goshawks seen; no response to taped calls
07/15/90	Rocky Canyon nest		3	Nest check; 3 fledged goshawks 200' from nest; 1 adult
	TOTAL HOURS:		18	

APPENDIX TABLE IE. GOSHAWK SURVEY SITES, 1990 TETON BASIN DISTRICT (D-5)

DATE	SITE	TRS	TIME (hours)	OBSERVATIONS
05/22/90	Grandview TS nest Pony Creek Rd. #663		3	Nest inactive, no reponse to tape, Long-eared owl nest found
05/22/90	N. Jackpine Loop		3	Check out report; no goshawks seen; no response to tape
07/02/90	District Orientation Program		1	
07/23/90	Gooseneck Timber Sale		6	Confirm goshawk sighting; saw 2 fledged goshawks. Cooper's nest 300' from gos nest
08/10/90	Gooseneck Timber Sale		6	Collected habitat data Heard goshawk calling
08/12/90	Bustle Creek West slope of Teton Range		6	Confirm goshawk sighting Found 2 fledged goshawks
	TOTAL HOURS:		25	

APPENDIX TABLE II. Reported Accipiter Sightings, 1990 Targhee National Forest

DIST	DATE	TIME	LOCATION	TRS	STATUS	OBSERVER
D-1	06/13/90		Kay Creek Unit 21		2 adults calling	D. Sleight
	06/26/90	08:00	Kay Creek Unit 21		Female gos flys in to tape	S. Patla
	07/17/90	07:00	Kay Creek Unit 21		2 fledged goshawks at nest	S. Patla
	07/29/90		Fritz Creek		Goshawk alarm call	S. Epstein
	08/02/90	19:00	Kay Creek Unit 21		2 young, 2 adults near nest	S. Patla
	08/03/90	16:00	Fritz Creek		1 young, 1 adult goshawk	S. Patla
	08/07/90	12:00	East Camas Creek		Adult goshawk flying	B. Aber
	08/10/90	13:30	Divide Creek		2 adult, 2 immat. goshawks	B. Aber
	08/14/90	10:00	South 3 Mile Creek		2 fledged gos respond to tape	S. Patla
	08/16/90	10:00	Sheep Cr. Elk Trans		3 immat. goshawks begging	S. Epstein
	08/23/90	11:00	South 3 Mile Creek		calling 1/4 mile from nest	S. Patla
	09/30/90		Miner's Creek TS		stick nest, whitewash,pellets	B. Aber
D-2	06/22/90	13:00	Staley Springs		Adult goshawk-defensive	M. Whitfield
	07/04/90	14:45	Tom Creek		Cooper's hawk flys in to tape	S. Patla
	07/11/90	11:30	Dry Canyon		Female gos flys in to tape	S. Patla
	07/18/90	19:00	Dry Canyon		Nest, 3 young goshawks	S. Patla
	07/25/90	19:00	Tom Creek		3 fledged Cooper's at nest	S. Patla
	07/26/90	11:30	Kick Creek		Raptor defensive behavior	L. Evan
	07/26/90	13:30	Dry Canyon		3 goshawks fledged	Patla, Gelatt
	07/31/90	14:00	Staley Springs		3 fledged gos respond to tape	S. Patla
	08/13/90	18:30	Green Can. Rd.#167		Goshawk flys over road	S. Patla
D-3	06/19/90	16:00	Hominy Peak nest		Adult Cooper's flys near nest	S. Patla
	07/25/90		Polebridge TS		Adult & fledged gos near nest	D. Reidden
	07/26/90	09:00	Polebridge TS		1 fledged, 1 dead goshawk	Patla, Worden
D-4	04/18/90	14:00	Rocky Canyon		Female gos incubation posture	S. Patla
	07/15/90	11:00	Rocky Canyon		3 fledged gos respond to tape	S. Patla
D-5	05/01/90	10:00	Trail, Moose Creek		2 goshawks chase over field	S. Patla
	05/10/90		Teton Canyon,WY		1 goshawk	ID Pereg. Report
	05/23/90		Trail, Moose Creek		2 goshawks chase over field	D. Patla
	06/07/90	19:00	Drake Canyon		Goshawk circles overhead	S. Patla
	06/21/90	14:00	N. Pine Creek		Adult goshawk flew overhead	T. Wagner
	07/17/90	12:45	Kirkham Hollow		2 immat, 1 adult, nest	N. Branson
	07/18/90		Gooseneck TS		2 adults defensive	M. Merigliano
	07/19/90	08:35	Kirkham Hollow		2 immat. goshawks begging	J. VanPelt
	07/23/90		Gooseneck TS		2 fledged gos respond to tape Cooper's nest 300' from gos	Patla, Branson
	07/28/90		Bustle Creek,WY		2 adults, 3 birds flying	G. McGregor
	08/12/90	10:00	Bustle Creek,WY		2 fledged goshawks	D. Patla
	08/15/90		Gooseneck TS		Young Sharp-shinneds calling	N. Branson
	09/07/90	12:00	S. Game Creek,WY		1 immat. goshawk perches	D. Patla
	09/24/90	10:00	Pinnacle Rd.,WY		1 goshawk alarm calling	D. Patla

APPENDIX TABLE III. ACTIVE GOSHAWK NEST SITES, 1990 TARGHEE NATIONAL FOREST

#	DISTRICT	MANAG AREA	LOCATIONa	TSR	AERIAL PHOTO#	NEST TREEb	#FLEDGED GOSHAWKS	REPORTED BY	DATE REPORTED
1.	D-1	3	Fritz Creek		186-82	NL	2	S. Epstein	07/29/90
2.	D-1	3	Divide Creek*		186-47	NL	2	B. Aber	08/10/90
3.	D-1	4	South Three Mile Creek (Unit 1)		176-297	DF	2	S. Patla	08/14/90
4.	D-1	4	Kay Creek Unit 21		185-72	DF	2	D. Sleight	06/13/90
5.	D-1	4	Sheep Creek		185-106	DF	3	S. Epstein	08/16/90
6.	D-2	4	Dry Canyon*		687-168	DF	3	S. Patla	07/18/90
7.	D-2	6	Staley Springs*		687-235	ASP	3	M Whitfield	06/22/90
8.	D-3	9	Polebridge*		285-189	LPP	1+1 dead	D. Reiden	07/26/90
9.	D-4	17	Rocky Canyon		182-168	ASP	3	S. Patla	04/18/90
10.	D-5	15	Bustle Creek*		1187-177	NL	2	G. McGregor	07/28/90
11.	D-5	16	Kirkham Hollow (Canyon Cr. TS)		182-135	DF	2	N. Branson	07/17/90
12.	D-5	16	Gooseneck*		182-198	DF	2	M. Merigliano	07/18/90
					*AVERAGE		2.2		

FOOTNOTES:

a. *marks new goshawk nest territories found in 1990 for Targhee National Forest

b. DF Douglas Fir
LPP Lodgepole Pine
ASP Aspen
NL nest tree not located

APPENDIX TABLE IV. KNOWN GOSHAWK NEST CLUSTERS

#	TERRITORY	#NEST TREES CHECKED 1990	STATUS
1.	Fritz Creek	2	active
2.	South Fork Deep Creek	1	
3.	South Three Mile Creek	1	active
4.	Sheep Creek	5	active
5.	Alex Draw	1	
6.	E. Steel Creek	2	
7.	Kay Creek	3	active
8.	Walking Fish TS	2	
9.	Taylor-Carrot TS	1	
10.	Fall River Ridge	3	
11.	Hominy Peak (MA 12 TS)	1	
12.	Grandview TS	1	
13.	Kirkham Hollow (CanyonCr TS)	2	active
14.	Ruby Creek (ArgumentRidge TS)	1	
15.	Rocky Canyon	2	active
16.	Long Gulch	2	

TOTAL NESTS CHECKED:	30

APPENDIX TABLE VA. NEST TREE DATA DOUGLAS FIR NESTS (PAGE 1), 1980-1990 TARGHEE NATIONAL FOREST

TERRITORY:	Fritz Cr	SFDeep S	3 Mile Cr	3 Mile Cr	Rattlesnk	Sheep Cr	Sheep Cr	Sheep Cr	Sheep Cr	Sheep Cr	Pete Cr	Alex Draw
YEAR ACTIVE:	alt	alt	83	90	83	87	90	alt #1	alt #2	alt #3	alt	83,89
DISTRICT:	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)
MANAGEMENT AR	3	3	4	4	4	4	4	4	4	4	4	4
NEST TREE:												
Species	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF
Age		218	135	175	122	NA	NA	NA	NA	NA	168	260
Height ft (m)	67(20)	120(37)	79(24)	96(29)	80(24)	89(27)	79(24)	80(24)	83(25)	82(25)	103(31)	99(30)
DBH in (cm)	15.4(39)	24.8(63)	21.6(55)	24.8(63)	19.1(48)	20.2(51)	21.3(54)	20.5(52)	16.0(41)	19.6(50)	24.9(63)	23.3(59)
Elevation ft (m)	7830 (2386)	7330 (2234)	6800 (2073)	7050 (2149)	7400 (2256)	7400 (2255)	7400 (2255)	7400 (2255)	7400 (2255)	7400 (2255)	7400 (2255)	7260 (2213)
NEST:												
Height ft (m)	28(8)	48(15)	32(10)	36(11)	43(13)	45(14)	36(11)	38(12)	38(12)	23(7)	45(14)	40(12)
Aspect	SW	NE		SE		SE	S	SE	SW	SW	--	SE
SLOPE:												
Position (in thirds)	upper	lower	upper	upper	flat	lower	mid	lower	lower	lower	upper	mid
Percent	27	67	41	14	10	39	35	11	2	13	10	16
Aspect	NE	NE	N	NW	SW	W	N	W	W	SW	N	S

APPENDIX TABLE VIC. NEST STAND DATA: GOSHAWK NEST SITES, LODGEPOLE PINE & ASPEN, 1980-1990 TARGHEE NF

TERRITORY:	Ruby Cr	Polebridg	MA 12	Rocky Can	Rocky Can	Staley Sp
YEARS ACTIVE:	86,89	90	89	86	90	90
DISTRICT:	(D-4)	(D-3)	(D-3)	(D-4)	(D-4)	(D-2)
MANAGEMENT AREAS:	16	9	12	17	17	6
A. *Dominant Tree Species:	LPP	LPP	LPP	ASP	ASP	ASP
B. *Nest Tree Species:	LPP	LPP	DF	ASP	ASP	ASP
C. Trees > 7" DBH						
Density all species: (#trees/acre)	210	*124	159	152	245	181
Density DOUGLAS FIR: (% total)			22 (14)	25 (16)		70 (39)
Density LODGEPOLE PINE: (% total)	210 (100)	124 (100)	137 (86)	16 (11)		
Density ASPEN: (% total)				111 (73)	245 (100)	111 (61)
D. Mean DBH inches (cm):						
DF			11.6(29)	9.5(24)		11.8(30)
LPP	9.9(25)	9.5(24)	7.9(20)			
ASP				11.6(29)	9.4(24)	9.2(23)
E. Density all trees 3-7" DBH:	159	35	381	86	76	57
F. Density all trees 1-3" DBH:	many	0	102	512	0	6
G. Density of seedlings < 1"DBH:	many	2620	251	NA		0
G. Density snags/acre:	115	232	150	6	25	41
H. Mean DBH snags inches (cm):	7.7(20)	7.7(19)	4.9(12)	10.7(27)	8.3(21)	7.2(18)
I. Old-growth parameters:						
a. Density trees > 20"DBH:	0	0	0	0	0	0
b. Density snags > 12"DBH:	9.5	0	0	0	0	0
J. Estimated % Canopy Cover:	70	40	90	65	85	65
K. Distance to water feet (m):	1000(305)		6336(1932)	1800(549)	1800(549)	
L. Distance to alternate nest in feet(m):	unknown	unknown	unknown	2000(610)	see left	unknown

APPENDIX TABLE VB. NEST TREE DATA DOUGLAS FIR GOSHAWK NESTS (p. 2), 1980-1990 TARGHEE NATIONAL FOREST

TERRITORY:	E Steel Cr	Kay Cr	Kay Cr	Kay Cr	Walk Fish	Walk Fish	TaylorCar	TaylorCar	Dry Can	Fall R	Hominy Pk
YEAR ACTIVE:	88	89	90	alt	89	alt	alt #1	alt #2	90	89	89
DISTRICT:	(D-1)	(D-1)	(D-1)	(D-1)	(D-2)	(D-2)	(D-2)	(D-2)	(D-2)	(D-3)	(D-3)
MANAGEMENT AR	4	4	4	4	4	4	4	4	4	12	12
NEST TREE:											
Species	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF
Age	NA	NA	150	NA	110	180	NA	NA	193	135	125
Height ft (m)	126(38)	73(22)	73(22)	65(20)	88(27)	108(33)	76(23)	79(21)	90(27)	98(30)	61(18)
DBH in (cm)	19.3(49)	13.5(34)	14.0(36)	14.0(36)	19.0(48)	26.0(66)	15.5(39)	21.2(54)	28.4(72)	22.5(57)	15.0(38)
Elevation ft (m)	6900 (2104)	7500 (2286)	7530 (2295)	7400 (2256)	6900 (2104)	6900 (2104)	7150 (2164)	7200 (2195)	6850 (2088)	6100 (1860)	6900 (2104)
NEST:											
Height ft (m)	55(17)	51(16)	38(12)	54(16)	53(16)	60(18)	32(10)	42(13)	26(8)	70(21)	42(13)
Aspect	W	W	W	center	SE	S	W	NE	E	N	center of tree
SLOPE:											
Position (in thirds)	mid	lower	mid	lower	lower	flat	upper	upper	upper	upper	upper
Percent	33	34	21	34	14	2	25	22	14	30	20
Aspect	NW	W	NW	W	SE	SE	W	SW	NE	N	W

APPENDIX TABLE VII. GOSHAWK BREEEDING TERRITORIES, 1980-1990 TARGHEE NATIONAL FOREST

#	MA	DISTRICT	LOCATION	TSR	YEAR ACTIVE	OBSERVATION
1.	3	D-1	Divide Creek		1990	2 adult, 2 immatures
2.	3	D-1	Fritz Creek		1988	16 June adult calling
					1989	2 fledged young
					1990	2 fledged young
3.	3	D-1	South Fork Deep Creek		1984	adult vocalizing-July
4.	4	D-1	Three Mile Creek, E.Rattlesnake TS Unit 2		1983	feathers/whitewash
			Three Mile Creek, E.Rattlesnake TS Unit 1		1990	2 fledged
5.	4	D-1	East Rattlenake Salvage Comp 440 Std 13		1983	pair-nest defense
6.	4	D-1	Sheep Creek Elk Transect 1		1985	pair-nest defense
			Sheep Creek Elk Transect 2		1990	3 fledged, alt. nest
7.	4	D-1	Pete Creek TS Unit 9		----	1 large stick nest
8.	4	D-1	Miner's Creek TS Unit 5		----	2 large stick nests
9.	4	D-1	Alex Draw TS Unit 17A		1983	1 nestling
					1989	2 fledged
10.	4	D-1	East Steel Creek TS Unit F		1988	3 young in nest
11.	4	D-1	Kay Creek Timber Sale Unit 21		1989	3 fledged
					1990	2 fledged
12.	4	D-2	Walking Fish TS Unit 9		1989	1 fledged
13.	4	D-2	Taylor-Carrot Unit 50		----	1988,90 Great Gray Owls
14.	4	D-2	Dry Canyon/Icehouse TS		1990	3 fledged
15.	6	D-2	Staley Springs		1990	3 fledged
16.	9	D-3	Polebridge		1990	1 fledged
17.	10	D-3	N. Antelope		1981	A. Franklin reported
18.	10	D-3	Eccles Rd. Unit 104-10		1985	2 adults/nest
19.	10	D-3	Anderson Mill TS		1981	A. Franklin reported
20.	12	D-3	Fall River Ridge		1989	3 fledged
21.	12	D-3	MA 12 Sale Area Unit 326-11 (Hominy Peak)		1989	1 fledged
22.	15	D-5	Dry Cr. TS Unit 22/24 (Morris Creek)		1980	2 young in nest
			Dry Cr. II Unit 9 (Horse Cr)		1986	active nest
23.	15	D-5	Dry Cr.II Unit 20 (Teepee Cr)		1985	1 young in nest
24.	15	D-5	Pole Canyon Unit 23		1987	2 adults; 3 young
25.	15	D-5	Bustle Creek		1990	2 fledged
26.	16	D-5	Grandview TS Nest #1		1981	adults,nest,whitewash
			Grandview TS Nest #2		1982	adults,nest,pellets
			Grandview TS Nest #3		1986	3 young in nest
27.	16	D-5	Canyon Cr. TS Unit 245/20		1986	adult defensive; vocal
28.	16	D-5	Canyon Cr. TS Unit 247/12		1987	adult defensive
			(Kirkham Hollow)		1989	1 fledge food begging
					1990	2 fledged
29.	16	D-5	Kirkham H. TS Unit 246/17 (Graham Spring)		1988	pair defensive
30.	16	D-5	Gooseneck TS		1990	3 fledged
31.	16	D-4	Argument Ridge TS Unit 17 (Ruby Creek)		1986	1 young in nest
					1989	incubation; nest failed
32.	17	D-4	Rocky Canyon		1986	adult defending nest
					1988	1 fledge, adult
					1990	3 fledge, alt. nest
33.	19	D-4	Water Canyon		1984	young/nest
34.	21	D-4	Long Gulch		----	2 large nests